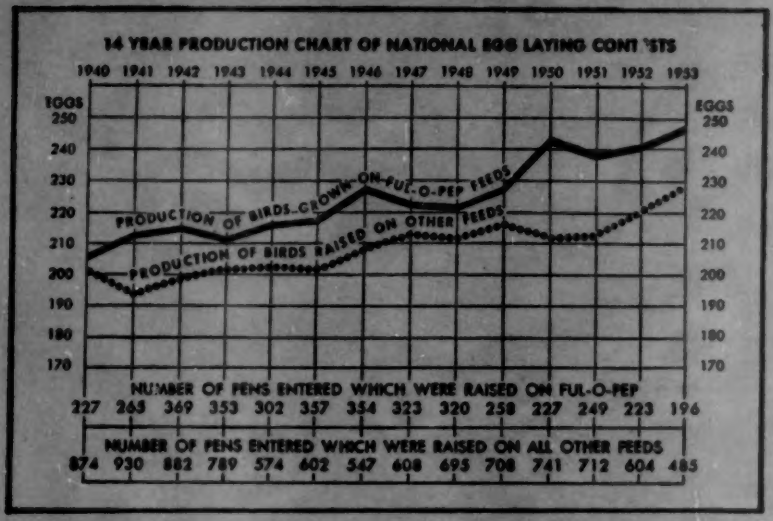
WORLD'S POULTRY SCIENCE JOURNAL

JANUARY - MARCH
1954

Official Organ of the
WORLD'S POULTRY SCIENCE ASSOCIATION
Volume 10 - Number 1

National Egg Laying Contests prove FUL-O-PEP GROWS AMERICA'S BEST PULLETS!


14 YEAR PRODUCTION CHART OF NATIONAL EGG LAYING CONTESTS
1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953
EGGS
250
240
230
220
210
200
190
180
170
PRODUCTION OF BIRDS GROWN ON FUL-O-PEP FEEDS
PRODUCTION OF BIRDS RAISED ON OTHER FEEDS
NUMBER OF PENS ENTERED WHICH WERE RAISED ON FUL-O-PEP
227 265 369 353 302 357 354 323 320 258 227 249 223 196
NUMBER OF PENS ENTERED WHICH WERE RAISED ON ALL OTHER FEEDS
874 930 882 789 574 602 547 608 695 708 741 712 604 485

Birds grown on Ful-O-Pep average laying the equivalent of 15 MORE 2-OZ. EGGS EACH

INFORMATION PRESENTED in the above chart is excellent proof that Ful-O-Pep grows America's Best Pullets.

YOU WILL NOTE that for the past 14 years in these official contests, 52,299 Ful-O-Pep raised birds averaged laying the equivalent of 15 more 2-oz. eggs each than the average of 126,763 birds grown on all other feeds. And during this time over half of the winning pens and hens were grown on Ful-O-Pep.

IN THE 1953 CONTESTS Ful-O-Pep raised birds averaged laying the equivalent of 19 more 2-oz. eggs each than birds grown on all other brands of feed. Ful-O-Pep feeders also won high pen in 7 and high hen in 5 of the 11 official tests.

CERTAINLY THIS SUPERIOR egg production is outstanding proof that Ful-O-Pep research is building better feeds. Best of all, the Ful-O-Pep Restricted Feeding Plan saves poultrymen up to 30% feed cost for growing pullets . . . the kind of birds that produce well and stand up under the strain of heavy, continuous laying.

THE QUAKER OATS COMPANY

. . . makers of dependable feeds for over 60 years

WORLD'S POULTRY SCIENCE JOURNAL

Volume 10 January-March Number 1

Editor

GUSTAVE F. HEUSER

Publication Committee

H. S. GUTTERIDGE, *Chairman*, Canada
J. R. CAVERS, Canada
F. M. FRONDA, Philippines
A. M. GERICKE, South Africa
M. A. JULL, U.S.A.
E. KARPOFF, U.S.A.
J. W. KINGHORNE, U.S.A.
F. LIEVENS, Belgium
IAN MacDOUGALL, England
N. OLSSON, Sweden
P. UBBELS, Holland

Advertising Committee

O. B. KENT, *Chairman*, U.S.A.
F. W. BRAY, Canada
J. DeBROIN, Canada
H. EBBELL, Switzerland
A. D. GOLDHAFT, U.S.A.
IAN MacDOUGALL, England
C. G. MAY, England
R. T. PARKHURST, U.S.A.
L. PASSEBON, France
J. D. SYKES, U.S.A.
W. D. TERMOHLEN, U.S.A.
G. de VRIES, Holland
JAN WIJVERKENS, Belgium

Published quarterly by the

WORLD'S POULTRY SCIENCE ASSOCIATION

Cornell University, Ithaca, N. Y., U.S.A.

Membership dues $3.00 a year of which $2.50 is for a year's subscription to the "World's Poultry Science Journal." Subscription rate, $3.50 a year. Advertising rates upon application.

Entered as second class matter May 31, 1945 at the Post Office at Ithaca, N. Y., under the act of March 3, 1879.

OFFICERS OF THE WORLD'S POULTRY SCIENCE ASSOCIATION

President, Mr. Alex Wiltzer (France)

Honorary Past Presidents
Mr. W. A. Kock (Denmark)
Mr. W. D. Termohlen (U.S.A.)

Vice Presidents
Dr. R. Coles (England)
Mr. J. W. Kinghorne (U.S.A.)
Mr. C. S. Th. Van Gink, (Holland)
Dr. F. Lievens (Belgium)
Dr. H. Engler (Switzerland)

Treasurer and Assistant-Secretary
Dr. G. F. Heuser (United States of America)

Secretary and Assistant-Treasurer
Major Ian Macdougall (England)

Members of Council:
Australia: Mr. R. W. Kurrle
Belgium: Mr. J. Van Ingelgem and Professor R. Willems
Canada: Professor J. R. Cavers, Dr. H. S. Gutteridge, and Mr. G. L. Landon
Denmark: Professor V. Adsersen and Mr. J. Traberg
Eire: Mr. D. Philpott
England: Mr. D. J. G. Black, Dr. R. F. Gordon, Mr. E. T. Halnan, Mr. C. Horton-Smith, Dr. S. K. Kon, Mr. W. Marshall, and Mr. K. Wilson.
Finland: Professor N. Westermarck
France: Mr. P. Waroquiez
Germany: Dr. A. von Burgsdorff-Garath and Dr. H. Havermann
Holland: Professor L. de Blieck and Mr. J. D. Tukker
India: Mr. S. G. Iyer
Israel: Mr. A. Livshutz
New Zealand: Mr. J. G. Kissling
Northern Ireland: Mr. J. G. Rhynehart
Norway: Mr. L. Svendsen
Pakistan: Mr. Nurul Islam
Scotland: Miss M. M. MacLeod and Mr. J. E. Wilson
South Africa: Professor A. M. Gericke
Spain: Mr. Luis Latorre
Sweden: Mr. E. Haeggblom and Professor N. Olssor
Switzerland: Mr. H. Ebbell and Mr. H. Kleb
U.S.A.: Mr. H. H. Alp, Dr. C. D. Carpenter, Dr. E. M. Funk, Mr. R. R. Hannas, Mr. R. M. Hanson, Dr. R. J. G. Jaap, Dr. M. A. Jull, Dr. O. B. Kent, Mr. M. C. Small and Mr. J. D. Sykes.

CONTENTS

Tenth World's Poultry Congress 4

The Poultry Research Centre at Edinburgh 7

Research Poultry Nutrition at the Rowett Research Institute
John Duckworth 9

The Impact of War-Time Controls on the Scottish Poultry Industry
O. J. Beilby 14

Tom Newman International Award 23

Scotland's Poultry Improvement Schemes—Yesterday and Today
M. M. MacLeod 24

Poultry Diseases in Scotland—A Survey 27

Seaweed as a Poultry Food
W. A. P. Black 33

Importance of the World's Poultry Production
H. Engler 36

Jull Hall 38

Compost (Built-Up) Litter as a Sanitation Procedure
D. C. Kennard 40

Sex-Linked Plumage Color Inheritance in Geese 44

Wheaten Laced Australorps 45

Attempts to Control Fowl Cholera by Medicated Feeds
C. I. Angstrom and J. S. Sickles 47

More Eggs with Antibiotics 48

Leucocytozoan Infection in Ducks
W. R. Hinshaw 50

Poultry Research Roundup—Rhode Island Experiment Station 50

More Eggs, Less Work—New Feeding Method
J. W. Kelly, E. W. Glazener and W. L. Blow 52

Lymphomatosis Research Yields Significant Results 55

Poultry Research Investigations at the Northern Ireland Agricultural Research Institute, Hillsborough, County Down 57

Crossbreeding in Poultry 58

Rate of Growth in Chickens
F. P. Jeffrey 60

Review of Poultry Publications 61

Financial Statement 79

Membership List 80

TENTH WORLD'S POULTRY CONGRESS

Edinburgh, Scotland, August 13th to 21st, 1954

The Department of Agriculture for Scotland report continued good progress with the organizational arrangements for the Tenth Congress.

The organizers are happy to be able to intimate that Mr. J. E. Wilson, the Officer-in-charge of the Veterinary Laboratory of the Ministry of Agriculture and Fisheries, at Lasswade near Edinburgh, has been invited and has very kindly agreed to deliver the third paper to be given at the opening plenary session. Mr. Wilson will speak about developments of major importance which have taken place in the field of disease control since the last Congress. Mr. Wilson will be well known to members of the World's Poultry Science Association being one of Scotland's two representatives on the Association's Council. He has been present at every previous Congress except for that held in the U.S.A. in 1939 which he was only prevented from attending at the last moment because of his appointment to his present office. As already reported, the other two papers to be given at the opening plenary session will be those in the fields of nutrition and genetics to be delivered respectively by Dr. Jukes of the Lederle Laboratories, New York, and Professor Lerner of the University of California.

Grounds of historic Lauriston Castle in which the Congress garden party will be held.

At the time of writing, the Papers and Sessions Committee are busily engaged in the work of selecting the papers to be accepted for presentation at the Congress. Altogether some 200 papers from twenty countries were submitted via National Committees or direct by authors but this number in order to provide adequate time for presentation and discussion at the sessions, will have to be considerably reduced. On the occasion of the Tenth Congress the Report of Proceedings is to be published in three volumes. Volume 1 will contain the papers to be presented at the Congress; volume 2, the summaries of these papers printed in the two official languages, namely English and French; and volume 3, the three addresses to be given at the opening plenary session together with some information about the Congress in retrospect. Volume 1 and 2 will, of course, be available to members before the Congress opens. If possible, volume 2, which contains the summaries, will be issued several weeks in advance so that members may have some time in which to study the programme. It is hoped that this arrangement will commend itself to members.

Principally because of space limitations in the main exhibition hall, the Education and Research Exhibition is being transferred to accommodation in the Royal Scottish Museum which is conveniently situated in close proximity to the Old College, Edinburgh University, where the sessions of the Congress are to meet. Members who are interested will thus, without having to make a special journey for the purpose, be able to pay a visit to the Museum which is well worthy of inspection. Dr. Allan, C.B.E., D.Sc., Ph.D., the Director of the Museum has very kindly agreed to act as Vice-Chairman of the Committee responsible for the Education and Research Exhibition.

The Corporation of the City of Edinburgh are providing civic hospitality to members of the Congress by way of a garden party at which the Lord Provost, Magistrates and Councillors will act as hosts. This garden party will be held on the afternoon of Wednesday, 18th August in the grounds of historic Lauriston Castle. This Castle commands a magnificent view over the Firth of Forth and the hills of Fife and is ideally situated among woodlands and spacious lawns as will be seen from the attached photograph.

Offers of hospitality, civic and private, are being received in generous measure for those taking part in the three Pre-Congress tours. By the time these notes appear the booklet containing all information about the tours will be in course of

distribution to members.

The Ladies Committee under the Chairmanship of Lady Elphinstone are now well forward with their plans for making the stay of the ladies a thoroughly enjoyable one. Private hospitality in the form of coffee and tea parties, conducted shopping expeditions, and visits to places of special interest have been arranged, such as famous Scottish tweed mills, potteries and cut-glass works. Lady Elphinstone herself has very kindly offered to receive a party of ladies at her home at Carberry Tower, near Edinburgh. A day trip on Sunday, 15th August, to Glamis Castle, the family home of Lady Elphinstone, is also being arranged.

The organizers would like to take this opportunity of again urging intending members of the Congress to submit their application for membership as soon as possible.

Information about any aspect of the Congress will be gladly supplied by The Administrative Secretary, Tenth World's Poultry Congress, St. Andrew's House, Edinburgh 1, Scotland.

Tenth World's Poultry Congress General Purposes Committee.

(Seated l. to r.): Dr. A. W. Greenwood, Lady Elphinstone D.C.V.O., Sir P. R. Laird K.B.E., C.B.; Mr. A. Glen C.B., M.C.; Mrs. M. E. Campbell C.B.E.; Major I. Macdougall O.B.E.

(Second row l. to r.): Mr. D. G. Russell, Mr. J. R. McCallum M.C., Mr. J. E. Wilson, Miss M. M. MacLoed, Mr. W. Adair O.B.E., Mr. G. Christie, Mr. J. Macpherson D.F.C.

(Third row l. to r): Mr. R. G. C. Nisbet M.B.E., M.S.M., Mr. H. W. Pearson, Mr. K. M. Davie, Mr. T. E. Whittle, Mr. Chalmers Watson, Mr. D. E. Simpson, Mr. H. MacNamara.

(Back row l. to r.): Mr. P. Charles, Mr. F. Macfarlane.

THE POULTRY RESEARCH CENTRE AT EDINBURGH

In 1947 the Agricultural Research Council of Great Britain, following the recommendation of one of a number of committees set up during the war to advise on post-war developments in agricultural research, decided to establish a center for poultry investigations. Its location at Edinburgh followed the appointment of Dr. Alan W. Greenwood as Director of the new organization. For many years he had worked under, and with, Professor Crew in the Animal Breeding Research Department, later to become the Institute of Animal Genetics of the University of Edinburgh.

The lack of facilities for keeping many birds for research was in 1928 largely offset by an allocation of funds from the Rockefeller Foundation whose generous gift established the Institute of Animal Genetics in its own buildings and provided adequate accommodation for experimental animals. From 1930 onwards an intensively housed flock of Brown Leghorns was built up from a relatively few foundation birds and this served the needs for both physiological and genetical investigations. It was taken over by the Poultry Research Centre and the staff were incorporated in the new organization when buildings, adjacent to the Institute of Animal Genetics and in proximity to other Science departments of the University, were ready for occupation in the winter of 1950. The physical facilities of the Center are contained within two separate structures, one housing the scientific and administrative staff, the other the flock of birds. They are adequately equipped.

The location of a research group should be related to its function and because the approach of the solution of problems of the Poultry Industry through the employment of highly skilled scientists is envisaged at Edinburgh, it was considered that the research workers should have immediately available to them, not only the extensive scientific libraries of a university but also the intellectual stimulation that comes from frequent contacts with scientists who though not specifically interested in poultry are making contributions to natural knowledge within their particular science.

From its inception an attempt has been and is still being made to collect together a group of research workers who by their individual and collective skills could be expected to undertake the investigation of almost any type of problems affecting the poultry industry. Since the flock has been free from highly infective pathological conditions only those non-specific

diseases which are an insiduous cause of loss to the national flock will be studied.

The present staffing at the Centre is as follows:

Genetics: J.S.S. Blyth, B.Sc., Ph.D.; R. Osborne, M.A. (Hons.), Dip. An. Genetics.

Physiology: Climatology: J.C.D. Hutchings, M.A.; Endocrinology: A.H. Sykes, B.A., Dip. Agr. Sc.; Reproduction: P.E. Lake, B.Sc., Dip. Agr. Sc.

Biochemistry: W. Bolton, D.Sc.

Animal Behavior: D.G.M. Wood-Gush, Ph.D., Dip. An. Genetics.

Pathology: M.C. Lancaster, B.Sc., M.R.C.V.S.

A special unit dealing with cancer and allied conditions in the fowl is maintained by the British Empire Cancer Campaign.

Virologist: J. G. Carr, D.Sc.

Pathologist: J. G. Campbell, Ph.D., F.R.C.V.S.

Biochemist: R. Bather, M.A.

In the short period of its existence more than 50 scientific papers and articles of general interest concerning the work of the Centre have been published. From other countries established workers and students proceeding to a research degree within the University of Edinburgh have been accommodated. It is pleasant to recall the stimulation to members of the staff that resulted from study leave spent at the Centre by such distinguished workers in the poultry field as Professor Michael Lerner of the University of California and Professor George Jaap of the University of Ohio.

An opportunity will be provided at the forthcoming Tenth World's Poultry Congress at Edinburgh in August for interested visitors to see the Poultry Research Centre, to meet the staff and to learn something of the activities in progress.

Scottish Poultry Research Centre, at Edinburgh, Scotland.

RESEARCH IN POULTRY NUTRITION AT THE ROWETT RESEARCH INSTITUTE

JOHN DUCKWORTH
The Rowett Research Institute, Aberdeen, Scotland

The poultry industry of the United Kingdom is mainly engaged in the production of table eggs, most of the poultry meat coming from laying flocks and only a small amount from specialized table bird production. Consequently by far the greatest proportion of the feed used in the poultry industry goes to the laying flock and accordingly the nutrition of the laying bird has the first call on the attention of the research worker. Most of the poultry research at the Institute is in this field and is directed to the development of more economical rations based on feeding stuffs commonly available in the U.K. and potential new feeding stuffs, on industrial by-products and synthetic materials.

In the United Kingdom the human population is large in relation to the animal population and this ensures that the by-products from milling wheat will always play an important part in poultry rations. Combined with a mixture of cereals, in which only a small amount of maize is included, the basis of laying rations is provided. Under average conditions these mixtures of cereals and miller's offals will contain between 11% and 12% of protein and when supplemented with minerals are about borderline for meeting the nutritional needs of laying birds on range, except under winter conditions. Under more intensive systems of management these simple rations need supplements to provide extra protein and vitamins, and an accurate knowledge of the degree of supplementation necessary becomes increasingly more pressing as more intensive methods of egg production are adopted here and as the shortage of protein-rich supplements, reflected in their high price, continues to prevail. Although the scientific literature contains a wealth of information about the supplementary relationships between soyabean meal and maize the information on the relationships between other portein concentrates, especially those of plant origin, and mixtures of cereals and miller's offals is meagre.

One of the principal research projects at the Institute is the determination of the deficiencies in the cereals-miller's offals mixes that are remedied by animal by-products and to investigate the extent to which deficiencies that arise when plant by-products replace animal by-products can be made

good by vitamin and, in some cases, amino acid supplements. In this connection attention has been given mainly to groundnut meal, special attention being concentrated on the effect of the method of processing on its nutritive value. However, unlike soybean meal, it is not susceptible to improvement by special methods of processing. The limiting amino acid for egg production is groundnut meal-cereals-miller's offals rations containing 11% of protein is methionine and while supplements of this amino acid raise production to normal levels the procedure is uneconomic at the present price of methionine.

The nutritive value of protein supplements made from marine material is also studied. Whale meals can be manufactured on Antarctic factory ships and be equal to fish meals as far as protein quality is concerned, but with a somewhat lower content of certain vitamins. During the normal processing of whales for oil about half the protein of the carcass passes into solution in the "stickwater." This liquor is concentrated to make "whale solubles" but its protein is of inferior value in poultry rations being no better than "condensed fish solubles" as a protein source. That is to say it is approximately equal to groundnut meal protein. Whale solubles have not proved to be a particularly rich source of vitamins.

Other studies arrived at conserving marine protein for feeding involve an exploration of methods of dealing with fish waste and with those large sporadic gluts of herring that overtax the normal processing capacity of plants that use the cook-and-press method of making herring meal. Past experiments have shown that holding the herring that is awaiting oil extraction in dilute caustic soda can be satisfactory for preserving fish for yielding oil but there is inevitably a certain amount of damage to protein value and vitamin content. Parallel work on the ensiling of white fish waste with formic acid has shown that this process is suitable for use at small ports remote from fish meal factories. The silage can be fed directly to poultry of all ages.

One of the main obstacles to economic grass drying in many parts of the United Kingdom is the high moisture content of the grass, a consequence of the wet climate. To reduce drying costs a local grass drying company developed a process in which part of the moisture is removed by putting the grass through an expeller before it passes to the drier. The expelled liquor contains a certain amount of leaf protein that can be

collected by heating the liquor after acidification. The nutritive value of this by-product is low, partly because of its poor digestibility by birds, and such chemical and physical treatments that have so far been tested fail to improve it.

It is well known that changes in the body weight of birds can be an unreliable guide to the nutritive value of a ration, particularly as far as energy is concerned since the fat content of the body varies widely. In studies of the energy value of rations for chicks and laying birds the metabolizable energy is determined by bomb calorimetry. Carcases are also analyzed and the energy value checked by bomb calorimetry. In some cases the values for productive energy are considerably lower than would be expected from information in the literature. These energy values are related to analytical data for the feed using methods more exact than those of ordinary proximate analysis.

Vitamin B_{12} deficiencies in United Kingdom types of all-plant rations are not so severe as in the American type of ration containing soyabean meal. This has been shown to be connected with the use of groundnut meal in place of soyabean meal, as the latter augments vitamin B_{12} requirement. When breeding hens are fed on rations containing no source of vita-

Aerial photograph of part of Rowett Research Institute, Aberdeen, Scotland.

min B_{12} and deriving their supplementary protein from soyabean meal hatchability is markedly reduced but when groundnut meal is used as the supplementary protein source hatchability is only slightly reduced, although the viability of the chicks is low. This is a consequence of the more rapid decline in the vitamin B_{12} content of the egg when soyabean meal is used in the ration.

In these studies of the vitamin B_{12} requirement of growing chicks and hens, laying hatching and table eggs, and of the content of the vitamin in feeding stuffs attention is also given to the problem of vitamin B_{12}, and other vitamins, synthesized in the intestine of birds. Carcasses, eggs and caecal content are assayed for their vitamin content in these studies, while parallel investigations are made of the microflora of the lower bowel by direct microscopy and cultural studies are described below. At the present stage of this work it is clear that the riboflavin and vitamin B_{12} that is synthesized by micro-organisms in the intestine make only a small contribution to the requirements of poultry, provided that coprophagy is prevented.

During recent years there has been a renewal of interest in the microflora of the gut of animals, particularly since the growth promoting action of antibiotics was discovered. It is suspected that the host may obtain important micro-nutrients synthesized by the organisms in the lower bowel, and that the kinds of organisms that predominate and their relative members may be decisively changed according to the nature of the undigested food residues reaching them. It is doubtful whether the classical dilution counting techniques as commonly used can shed great light on the complex ecological system in the gut, especially when attention is restricted to such easily grown bacteria as coliforms and enterococci, and most particularly if droppings alone are examined. The methods of choice are those where living material is examined in a hot-box as wet preparations or agar-stabilized films using phase-contrast and polarized light. Detailed studies are being made using straight ultra-violet and ultra-violet negative phase-contrast microscopy as in the study of bacteria in the sheep's stomach system. Such studies in the ruminant have revealed unsuspected features in microbial morphology and now work on caecal material from poultry is yielding results of promise. On the basis of the findings by direct microscopy selected micro-organisms are isolated, grown in pure culture and their stability to synthesize vitamins determined.

Recent communications from the Institute on poultry nutrition are:

A. ORIGINAL PAPERS

"The Digestibility of Linseed Oil and Mutton Fat by Chicks," J. Duckworth, J. M. Naftalin & A. C. Dalgarno, J. Agric. Sci., *40*, 39 (1950).
"The Nutritive Value of Herring 'Alkali-Reduction' Meal for Chicks," K. J. Carpenter & J. Duckworth, J. Agric. Sci. *40*, 44 (1950).
"Variables affecting the Response of Chicks to Animal Protein Factors in the Ration," K. J. Carpenter & J. Duckworth, Brit. J. Nutrit., *4*, xi (1950).
"The Design of Growth Experiments with Chicks," A. W. Boyne, K. J. Carpenter & J. Duckworth, Brit. J. Nutrit., *4*, vii (1950).
"All Vegetable Rations under United Kingdom Conditions," K. J. Carpenter & J. Duckworth, Proc. 9th World's Poult. Congr., *2*, 18 (1951).
"Economies in the Use of Animal By-Products in Poultry Rations. 1. Vitamins and Amino-Acid Provision for Starting and Growing Chicks," K. J. Carpenter & J. Duckworth. J. Agric. Sci., *41*, 297 (1951).
"The Egg Production of Pullets Fed on a Ration Containing Aureomycin," K. J. Carpenter & J. Duckworth, Nature, *169*, 669 (1952).
"The Nutritional Evaluation of Protein Concentrates Obtained from the Alkali-Digestion of Herrings," K. J. Carpenter, J. Duckworth, G. M. Ellinger & D. H. Shrimpton, J. Sci. Food & Agric., *3*, 278 (1952).
"The Supplementary Protein Value of a By-Product from Grass Processing," K. J. Carpenter, J. Duckworth & G. M. Ellinger, Proc. Nutrit, Soc., *6*, xii (1952).
"Economies in the Use of Animal By-Products in Poultry Rations. II. Protein and Vitamin Provision for Laying Hens," K. J. Carpenter, J. Duckworth & G. M. Ellinger, J. Agric. Sci. in the press.
"The Evaluation of Whale By-Products as Feeding-Stuffs," K. J. Carpenter, G. M. Ellinger & D. H. Shrimpton, J. Sci. Food & Agric., in the press.
"The Retention of Vitamin B_{12} by the Chick Receiving All-Vegetable Rations," D. H. Shrimpton, Proc. Nutrit. Soc., in the press.

B. REVIEWS AND GENERAL ARTICLES

"The Requirements of Poultry for Aneurin, Choline, Folic Acid, Nicotinic Acid, Pantothenic Acid and Riboflavin," J. Duckworth & G. M. Ellinger, Brit. J. Nutrit., *3*, 253 (1949).
"The Relative Nutritional Values of Animal and Vegetable Proteins for Animals," K. J. Carpenter, Brit. J. Nutrit., *5*, 243 (1951).
"The Significance of the Vitamin B Complex for Meat Production," K. J. Carpenter, Proc. VIth Internat. Congr. Anim. Husbandry (Copenhagen), *2*, 68 (1952).
"Anim. Protein for Poultry and Pigs," K. J. Carpenter & J. Duckworth, Brit. Agric. Bull., *5*, 165 (1952).
"Antibiotics and the Animal Industry," K. J. Carpenter & J. Duckworth, Brit. Agric. Bull., *6*, 107 (1953).
"The Results of Experimental Trials with Antibiotics," K. J. Carpenter, World's Poult. Sci. J., *9*, 16 (1953).
"Factors Affecting Cereals as a Food," J. Duckworth, Chemistry & Industry, p. 1139 (1952).

WANTED

Inquiries concerning the proceedings of the following previous World's Poultry Congresses have been recently received: Holland (1921), Italy (1933), Germany (1936), United States (1939). If any person has any of these Proceedings and would care to dispose of them please notify Dr. G. F. Heuser, Rice Hall, Ithaca, N. Y., U.S.A.

THE IMPACT OF WAR-TIME CONTROLS ON THE SCOTTISH POULTRY INDUSTRY

O. J. BEILBY

Department of Agriculture for Scotland, Edinburgh, Scotland

Poultry-keeping has always made an important contribution to the agricultural output of Scotland. In the years immediately preceding the war the value of the output of eggs and poultry amounted to nearly £4 million or about 10 per cent of the total output. Only milk and fat cattle contributed a larger share of output.

Despite its economic importance poultry keeping in Scotland was, and is, treated largely as a sideline. The breeding, rearing and feeding of cattle and sheep, and the growing of crops largely determine the basic types of farming in Scotland. It is only on the exceptional farm that the organization revolves round poultry. This follows from the fact that poultry can be kept on a small area of land and thus play only a minor role in determining the pattern of land utilization.

While poultry-keeping is regarded generally as a sideline, it is widespread. Practically every farm and every part-time and spare-time holding, has some poultry. The average full-time farm has some 150 head of poultry in June—rather more in some districts and on some types of farm and rather less in others. About half the flock will consist of laying hens and the remainder of young fowls, ducks, geese and turkeys. Poultry meat is largely a by-product of egg production in Scotland so this paper will deal mainly with the effects of war-time controls on egg production.

Changes in poultry numbers in Scotland since 1926 are shown on the accompanying diagram. (Fig.1). A steady expansion from 1926 to 1933 was followed by a falling tendency until 1939. During the 1930's various proposals were made for the reorganization of marketing under the Agricultural Marketing Acts but these did not find favor with producers and there were likely to be great administrative difficulties in controlling such a large number of producers whose output, though large in aggregate, was individually small. In 1939 a Poultry Industry Bill was before Parliament providing for stock improvement and for market reform but this was subsequently dropped owing to the outbreak of war.

WAR-TIME CONTROL

Agricultural policy during the war aimed at firstly, maximum production of crops for human consumption and secondly

at maintaining the milk supply. This policy was implemented, *inter alia*, by a comprehensive system of price controls and by the rationing of animal feeding stuffs. Poultry being competitors for human food, and being less efficient converters of feeding stuffs than the dairy cow, were given a relatively low

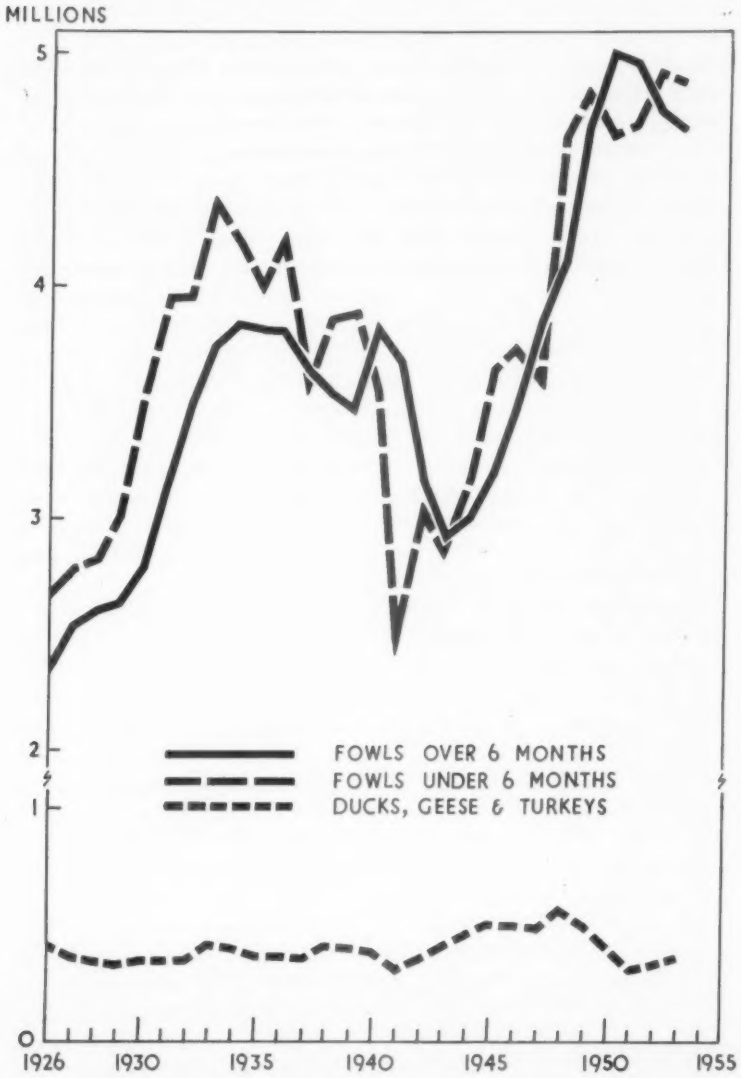


Fig. 1. Poultry numbers, Scotland, 1926-1953.

priority. Thus, economies in imports of feeding stuffs were largely at the expense of cereals for pigs and poultry. The control of egg prices aimed at stabilizing the cost of living and at securing an equitable distribution of a reduced supply of eggs to the whole population.

The feeding stuffs rationing scheme came into operation early in 1941. Rations for poultry were based on the numbers of birds on each farm in June 1939 or December 1940. The "basic" ration varied from time to time but, from April, 1941 to the end of the war it provided feed for only one-eighth to one-sixth of the pre-war number of birds on each farm.

The comprehensive control scheme finally evolved for egg marketing required all producers with more than 25 birds over 2 months old to sell their eggs to a packing station or licensed buyer, though they were allowed to retain as many eggs as they wanted for their own use. Egg prices to producers were fixed on a flat rate basis without seasonal variations. After 1941 retail egg prices were fixed at a level *below* that received by producers. The Government injected a subsidy to cover this difference in prices and the intermediate marketing costs. This policy was adopted partly in order to stabilize consumer prices and partly to provide an incentive to producers to market their eggs through packing stations and so channel supplies into urban markets. Nevertheless many eggs were sold locally at prices above the legal level and egg consumption in rural areas (and for persons with backyard flocks) was much higher than in urban areas.

During and after the war the demand for eggs remained strong owing to the general shortage of food and to the higher purchasing power of consumers. Egg prices rose substantially in 1939/40 before price controls were fully effective and remained at a high level compared with most other agricultural products—e.g. milk. Feeding stuff prices increased substantially after the outbreak of war until full control was in operation, but were stabilized from 1943 to 1948 at about 75 per cent over the pre-war level. Not until 1949 and 1950—when the feeding stuffs subsidy was removed—did prices rise proportionately to egg prices.

The course of egg and feeding stuff prices since 1939 is shown in figure 2. The index of purchased feed prices is not an altogether satisfactory measure of poultry feed costs, both because it includes feeds consumed by other classes of stock—e.g. dairy cows—and because a higher proportion of feed grown on the farm was used as compared with pre-war. The

market value of the home-grown feed would be nearer to the index of oat prices which is also shown. An index of the cost of poultry feed might be said to lie somewhere between the indices for oats and purchased feed. It is clear, however, that, from 1939 to 1949, the egg-feed price ratio was favorable to producers and there was a strong *financial* incentive to increase egg production.

The rationing of feeding stuffs, however, ruled out the possibility of expansion for most Scottish egg producers. The specialist poultry farmer, generally with a small acreage in relation to his number of birds, was severely hit and had to make a drastic cut in the size of his poultry flock. Approved breeders, however, received supplementary rations and found an expanding market for the sale of young stock to the in-

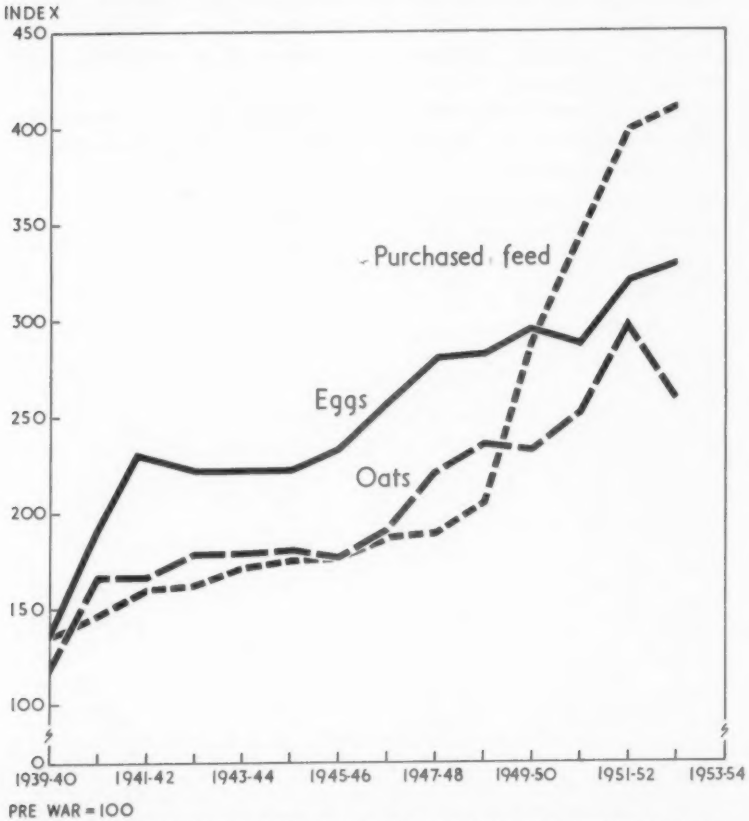


Fig. 2. Index Numbers of the Prices of Eggs, Oats and Purchased Feed.

creased numbers of domestic and backyard poultry keepers. This alternative, however, was open to only a few of the former specialist egg producers. This drastic reduction in flock numbers and the lower egg yields from those birds which remained—due to the necessity to make do with substitute feeding stuffs—increased the incidence of overhead costs per unit of output. Moreover, the flat rate egg price provided no encouragement to winter egg production. In the circumstances many specialist poultry farmers went out of business; in 1947 there were only some 250 farms of this type in Scotland with only 5 per cent of the poultry population on agricultural holdings.

The general farmer, to whom poultry were only a minor enterprise, was less severely hit but he, too, was often obliged to reduce his flock numbers. He could, however, feed to poultry feeding stuffs grown on his own farm. As a result of the ploughing up campaign and the consequent expansion of the cereal acreage—particularly where this was mainly in oats—farmers in some districts, e.g. Aberdeenshire, were able not only to maintain but, in the later war years, even to increase their poultry numbers.

POST-WAR DEVELOPMENTS

Expansion of farm flocks became fairly general after 1945 stimulated by the favorable egg-feed price ratio, already mentioned, and by a slight easing in the feeding stuffs position. At this time free range flocks, kept in movable houses, became popular since they fitted in well with the general economy of the farm and helped to maintain soil fertility. With this system of management, however, and with a lack of protein feed to provide a balanced ration, winter production and annual egg yields remained relatively low. The average yield per bird in Scotland, for instance, was estimated to be about 140 in 1948, compared with 150 pre-war and with about 130 in the mid-war years.

The withdrawal of the feeding stuffs subsidy after 1949, the issue of "bonus" rations for deliveries of eggs to packing stations, and the re-introduction of seasonal producer prices in 1950 again altered the economic balance of the industry. In 1950 the egg-feed price ratio returned to about the pre-war level and has subsequently been less favorable. In 1953 decontrol of egg prices in March and decontrol of feeding stuff supplies and prices in August have again altered the economic climate and at the time of writing (January, 1954) it is still too early to say what the results will be. The fact that,

for some months in 1953, egg prices were at or near the minimum "support" level—which was below the previous "fixed" price—has made producers uncertain about future prospects. The decontrol of feeding stuffs, however, has had a beneficial effect. Adequate supplies are now generally available and it is possible to feed a more balanced and suitable ration for laying hens. All these factors should provide an opportunity to reduce production costs by increasing egg yields and by adopting improved, and generally more intensive, systems of management. There has, in fact, already been a considerable development of hen batteries and of the deep litter system.

DISTRIBUTION OF POULTRY IN SCOTLAND

The effects of controls since 1939 on the geographical distribution of the poultry population are shown on the accompanying maps (figure 3) which give the density of poultry by counties in 1939 and 1953 per 100 acres of crops and grass. The maps show that a large part of Scotland has from 100 to 200 poultry (including young fowls, ducks, geese and turkeys) per 100 acres. On full-time farms which average about 150 acres in size, this is equivalent to an ordinary farm flock of 150-250 birds.

Certain areas both in 1939 and 1953, have a density considerably above average—notably Orkney with over 500 birds per 100 acres and some of the north-eastern counties. The extreme south-eastern counties, on the other hand, have a low density.

Variations in the density of the poultry population, both in 1939 and 1953, are more closely correlated with size of farm than with any other factor. Excluding the crofting area of the north-western seaboard, where the agricultural units are mostly of a part-time subsistence type—the density of the poultry population varies inversely with the size of farm. On the small family farms of Orkney and North-East Scotland poultry provide an important supplement to the income derived from other enterprises, which in pre-war days was often meagre. In the 1930's with the low price of oats—the chief cereal grown—it was more profitable to convert the oats into eggs rather than sell them as a cash crop. During the war increased quantities of oats were grown as a result of the tillage campaign and the main difficulty was to secure protein feed to make a balanced ration. Nevertheless many more poultry are now kept in the north-eastern counties than in 1939.

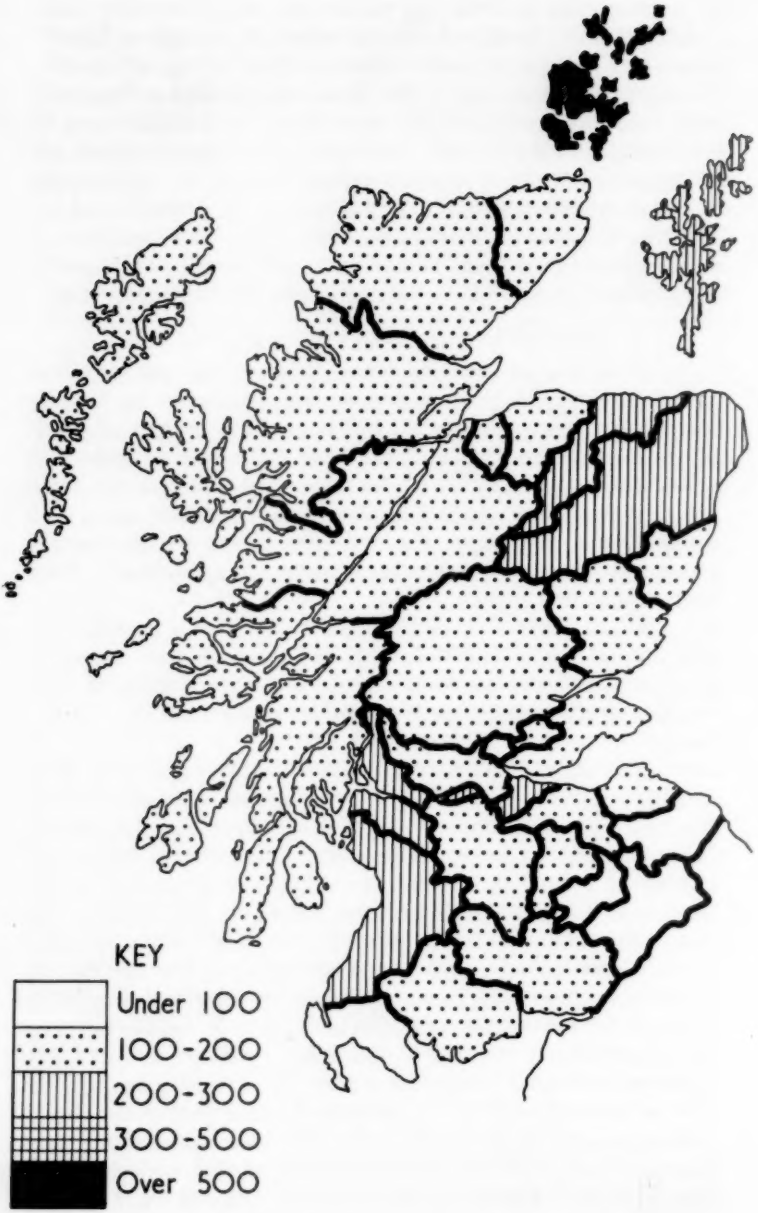


Fig. 3. Poultry per 100 acres crops and grass, 1953.

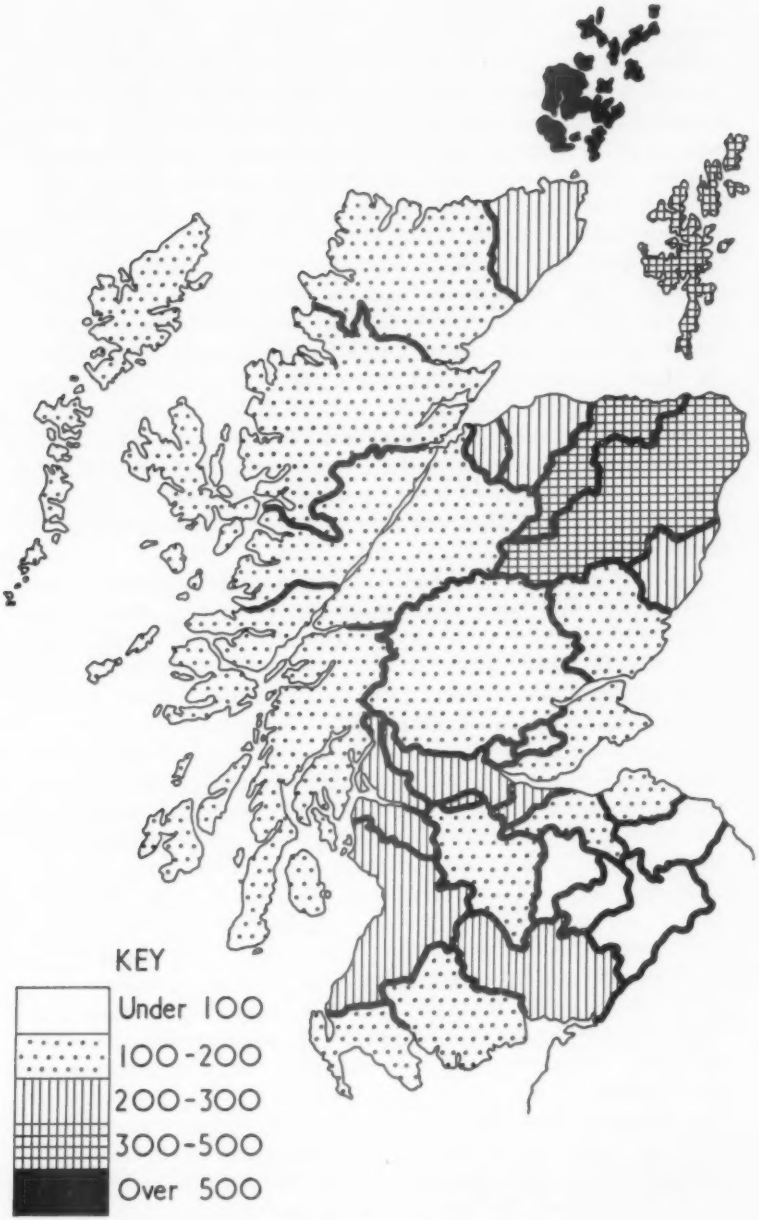


Fig. 4. Poultry per 100 acres crops and grass, 1953.

South-west Scotland—particularly the counties in the neighborhood of Glasgow—is the other area where poultry density is above average. This region has, however, declined in relative importance since 1939. In pre-war days most of the specialist poultry farms were located here where they were well placed to cater for the large urban market in the Glasgow district. This is very largely a region of medium sized dairy farms and in the pre-war period poultry keeping and dairying were quite a common combination. As already mentioned, dairy cows had first claim on available feed supplies during the war. Even when dairy farmers were able to grow more feed on their own land this was all required to supplement the reduced rations they were able to purchase for their cows. For these reasons the decline in poultry numbers in the South West was greater than in the rest of Scotland after 1939. There has, however, been a substantial recovery in poultry numbers in the last year or two, but in two of the important counties—Ayr and Renfrew—numbers are not yet up to pre-war levels; in most other counties in this region numbers now exceed pre-war.

In the south-east of Scotland the poultry keeping tradition has not developed to the same extent as elsewhere. This appears to be due mainly to the preponderance of large scale capitalist farming in this region and to the absence of any large urban market seeing that Edinburgh has traditionally obtained much of its egg supply from Orkney.

The recent decontrol of feeding stuffs and of egg prices may well bring about further changes in the relative importance of poultry in different parts of Scotland and in the economics of poultry keeping generally. Any regional differentiation in egg prices which may develop under free market conditions will tend to favor producers near the large urban markets in central Scotland. There should be greater opportunities, however, for improvements in technical efficiency. A study of the available data on production costs, food consumption per dozen eggs etc. indicates that war-time controls—particularly feeding stuffs rationing—have undoubtedly retarded technical developments more than in other enterprises such as dairying.

Despite these handicaps the output of eggs and poultry now accounts for 12 per cent of the value of the Scottish agricultural output compared with 10 per cent before the war. The present estimated annual production of 850 million eggs (including domestic and backyard flocks) is over 30

per cent greater than prewar and is sufficient to provide, from home sources alone, 170 eggs per person per year; production of poultry meat, however, is only 10,000 tons or 4½ lbs. per person per year. With the present more competitive conditions a further expansion of egg and poultry production will clearly depend largely on the question of how farm production costs can be reduced now that some of the hindrances to technical development have been removed.

TOM NEWMAN INTERNATIONAL AWARD

The Secretary (Mr. John R. Harvey, F.C.I.S.) of the Tom Newman International Award announces that the Award Committee in the United Kingdom has decided that the 1953 Award shall be made to Dr. Henry Van Roekel, D.V.M., Ph.D., of the Department of Veterinary Science, University of Massachusetts, Amherst, Massachusetts, U.S.A.

The Award consists of a handsome medal and £50 sterling. It is given for what in the opinion of the Award Committee, meeting in London, is the most important contribution to poultry husbandry research work published, in the previous year, for the benefit of poultry husbandry.

The Award, instituted in 1948 by Poultry Association of Great Britain, has been won on 5 occasions by U.S.A. research workers and once by a U.K. research worker.

There are Corresponding Secretaries for the Award in every country where poultry husbandry is developed into an industry. The Corresponding Secretary for the U.S.A. is Dr. Morley A. Jull, of the University of Maryland.

Amongst the members of the Award Committee in the U.K. are Sir Thomas Dalling, M.A., F.R.C.V.S., Mr. E. T. Halnan, M.A. (of Cambridge), Mr. Michael Pease, M.A. (of Cambridge).

The work published in 1952 in which Dr. Van Roekel was concerned embraced:

A report of pullorum disease eradication in Massachusetts.

A survey of the incidence of anti-genic forms of salmonella pullorum in the U.S.A.

Chronic Respiratory Disease of Chickens.

An egg-propagated immunizing agent for the control of infectious bronchitis of chickens.

Cultural attributes of the Chronic Respiratory Agent.

SCOTLAND'S POULTRY IMPROVEMENT SCHEMES—YESTERDAY AND TODAY

M. M. MacLEOD
Department of Agriculture for Scotland
Edinburgh, Scotland

Among the responsibilities inherited by the Department of Agriculture for Scotland, when, as the Board of Agriculture, it was constituted by statute in 1912, was a scheme for the improvement of poultry keeping in the congested or, agriculturally speaking, more backward areas of the country. The scheme had as its basis the establishment of a number of grant-aided poultry breeding stations from which sittings of eggs of pure breeds of poultry were distributed at subsidized prices and where sound methods of management, as then understood, were demonstrated.

The scope of the scheme was widened in 1913 to apply to the whole of the country and that year the number of stations in operation was 151, which between them sold 17,906 dozens of hatching eggs; by 1915 the number of stations had increased to 273 and the sales to 39,297 dozens so that pure breeds were then beginning to replace at least some of the nondescript mongrels largely constituting the poultry population at that time, which was in the region of 4,000,000 birds.

The end of the first world war saw the beginnings of tremendous developments in the business of poultry keeping, and, official schemes, if they were to continue to serve any useful purpose, had obviously to keep pace with these developments. Thus it was that in 1919 trap nesting of the pullet flock was encouraged by the payment of special grants to station holders able and willing to undertake this work; by 1926 approval was conditional on satisfactory records being available for at least the three winter months, and at a later stage records were required for a full pullet year of forty-eight weeks.

Blood testing for B.W.D. (pullorum disease) was introduced in 1929 and made compulsory in 1931, by which time the industry had made much progress within itself, and, as the number of independent breeders increased, so was there a falling off in the number of official station holders until by 1936 it had become clear that the scheme as then operated was again due for revision. The spectre of disease, a concomitant of the perhaps too rapid expansion of the industry, was looming on the horizon and, when in 1937 the Department inaugu-

rated their *Scheme for the Accreditation of Poultry Breeding Stations,* the emphasis was placed on the health of the bird rather than on its record.

This new scheme from the outset attracted a greater number of adherents than its predecessor and during the war years, for reasons not unconnected with the preference given to approved breeding flocks in the allocation of limited supplies of feedingstuffs, it expanded very rapidly.

Participation in the Scheme is restricted to breeders who are able to satisfy the Department as to their experience and breeding policy and whose stock is healthy, a good breed type, with satisfactory records of production and maintained under good standards of management. Normally new applicants require to serve a probationary period before being granted full accreditation. There are two grades of stations, firstly the *Breeders' Grade,* which applies exclusively to pure stock bred on pedigree lines, and secondly the General Grade wherein are included flocks not necessarily individually recorded and which may be mated for the production of first crosses.

There are certain basic regulations common to both grades on such essentials as stock quality, records, general management, sales and disease control, including blood testing for B.W.D., in addition to which there are further requirements which must be met, especially in regard to breeding practice, before acceptance in *Breeders' Grade* can be attained. The detailed regulations are revised from time to time in consultation with representatives of the three Scottish Agricultural Colleges, the Animal Health Division of the Ministry of Agriculture and Fisheries and the Poultry Advisory Committee set up by the Secretary of State for Scotland to advise him on matters relating to the poultry industry, with particular reference to stock improvement.

Complementary to the breeding scheme the *Accredited Hatcheries Scheme* makes provision for the recognition of hatcheries in which the equipment and management are up to the Department's requirements and where only eggs from fully accredited sources are incubated. The hatcheries, like the breeding stations, are subject to regular official inspection and an essential feature of the schemes is the publication annually of a combined *Register of Accredited Poultry Breeding Stations and Hatcheries* wherein full information is given as to the enterprises approved and the stock available.

Of the breeds kept the Rhode Island Red is far and away the most numerous accounting for 42.13% of all breeds

mated for pure breeding. They are followed by Light Sussex and White Leghorn representing respectively 26.41% and 13.65%.

A very significant trend correlated with the growth of the hatchery business is shown by the number of birds mated for the production of first crosses, which matings represent no less than 67.29% of the total.

The popular crosses are Brown Leghorn x Light Sussex (21.23%), Black Leghorn x Rhode Island Red (14.23%) and Rhode Island Red x Light Sussex (13.59%).

Ducks and turkeys are included in the schemes but of course to a less extent than fowls, the number of duck stations being 57 with a total of 2,230 birds and turkeys 5,475 on 54 stations.

That the schemes are playing a part of no little importance in the maintenance of healthy productive flocks can be gathered from the fact that at the present time they include in their membership 897 fully accredited breeding stations with an aggregate of approximately half a million breeding birds, as well as 28 hatcheries with a total incubating capacity of just over 2,200,000 eggs; in addition to this there are a further 73 stations and 3 hatcheries on probation.

These figures considered in relation to our total poultry population of under 10,000,000 birds of all ages are an index of the value attached by the industry to the official recognition of sources of supply.

In Memoriam

Professor W. C. Thompson, Member of the Council of the World's Poultry Science Association for the United States, 1927-1933.

Reviewer for the Library Section of the World's Poultry Science Journal since its beginning in 1947.

POULTRY DISEASES IN SCOTLAND—A SURVEY

J. E. WILSON
Ministry of Agriculture and Fisheries, Lasswade, Midlothian, Scotland

It is probably true to say that during the early years of this century very little attention was paid to diseases of poultry in Scotland although facilities for diagnosis were available at the Royal (Dick) Veterinary College at Edinburgh since 1913. Dr. O. Charnock Bradley, the Principal of the College foresaw the coming importance of poultry keeping and did much to foster interest in the study of poultry diseases throughout his long and distinguished career as Principal until his death in 1937. As a result special lecture courses were available to veterinary students in Edinburgh earlier than elsewhere in Great Britain.

The rapid expansion of poultry keeping from an adjunct to the general farm to the status of a specialized industry following the 1914-1918 war, aggravated losses from disease and brought a demand for the provision of laboratories equipped to carry out post-mortem examinations and agglutination testing. These were provided in England by the Ministry of Agriculture which instituted a special department in their laboratory at Weybridge in 1924, and in Scotland by the Royal (Dick) Veterinary College where a Department of Poultry Diseases was set up in 1925. In 1939 the Ministry of Agriculture established a Poultry Laboratory at Lasswade near Edinburgh and much of the work previously carried out at the Veterinary College, including that for the Department of Agriculture for Scotland, was transferred there. The work of the new laboratory expanded rapidly and in addition to dealing with Scotland it became responsible for providing a similar service for the six northern counties of England. Its scope was also increased to deal with certain diseases of cattle and other farm animals but poultry remains the chief interest. The laboratory consists of a converted mansion house standing in beautiful grounds surrounded by modern, well equipped buildings including loose boxes, piggeries, isolation units and all the usual services which go to the making of modern research and diagnostic units. There are six veterinarians on the staff which at present numbers 46. Poultry workers from many parts of the world come to the laboratory for advanced study: a warm welcome is extended to visitors attending the World's Poultry Congress in Edinburgh.

The great changes which have taken place in poultry husbandry with the ever growing tendency towards intensivism and larger and larger units have provided complementary problems of disease control and prevention and presented projects for research both long term and *ad hoc*.

Some diseases, once important, have waned into comparative insignificance, e.g. gapes, tuberculosis, fowl pox, while others have assumed a greater significance, e.g. fowl paralysis, salmonellosis and Newcastle disease.

Although from time to time serious outbreaks of infectious disease have occurred it may be said that most have been localized and Scotland has been fortunate in never experiencing large widespread epidemics. This is probably at least partly due to the relative absence of large areas densely populated by poultry and to the prompt and efficient measures taken to prevent spread of disease from other parts of the country.

DISEASES OF FOWLS

The prevailing diseases are those commonly seen in most countries. Fowl paralysis and the various forms of leucosis present one of the most serious problems. The former disease was first recorded in England in 1929 but cases were not diagnosed in Scotland until 1931 and not until several years later did it assume really serious proportions. Leucosis on the other hand had been known for many years and there are records of osteopetrosis which some have considered to be a part of this complex, extending back into last century. There has thus been a tendency not to consider these conditions as different manifestations of a single disease. Research work in Scotland has confirmed the presence of strains of fowls possessing an inherited susceptibility or resistance, the unimportant part played by egg transmission at least in the neural type of the disease, and the value of isolation during the first few weeks of the chicks' life as a means of minimizing losses. Tumor formation (as distinct from the Lymphomatous type) is a common source of loss but the incidence does not appear to be as high as in some countries. Haemagiomata (blood vessel tumors) appear to be much more common and here too there is a hereditary basis. The increased incidence of hereditary defects is probably associated with the greater use of pullets for the provision of cross-breds which are so popular for commercial egg production.

Scotland at present enjoys complete freedom from Newcastle disease. The last recorded outbreak was in 1951. Following the introduction of the disease into England in the

spring of 1947, after an absence of fourteen years, many feared its spread into Scotland. There was a single outbreak in 1948 caused by the illegal movement of birds from England but it was not until the autumn of 1949 that the disease became prominent. Several outbreaks occurred in Orkney from where the disease subsequently spread to other islands off the North West coast of Scotland. It suddenly appeared on the Bass Rock, a small island in the Firth of Forth, consisting of a bare precipitous rock projecting straight from the sea and inhabited only by a lighthouse keeper. There were 203 outbreaks in 1949, 21 in 1950 and 44 in 1951. It has never been possible to ascertain the original source of infection or to provide a completely satisfactory explanation of the methods of spread. A pleasure yacht at anchorage, provisioned with infected carcases from the South, may have been originally responsible. The disposal, in the sea, of carcases from subsequent outbreaks could account for spread by tidal currents to other islands, and scavenging sea birds in some cases may have acted as mechanical carriers. Several later outbreaks were traced to the introduction of stock from England. For several years now the importation into Scotland from England of live poultry including day-old chicks and hatching eggs has been entirely prohibited and this precaution has been largely responsible for the favorable position which now exists.

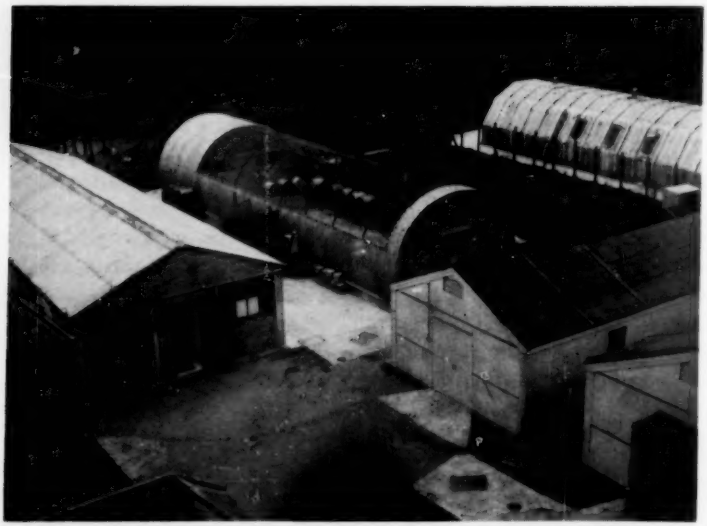
Outbreaks of laryngo-tracheitis occur from time to time but these are usually localized and the disease has never presented a serious problem. Each outbreak is treated on its merits but generally speaking the owner is encouraged to slaughter the affected pen in an effort to prevent further spread. Vaccination is never practiced.

Fowl typhoid is practically confined to the islands off the North West coast where methods of poultry husbandry are less progressive than on the mainland where the disease is rarely seen. Outbreaks of acute fowl cholera causing a high death rate are rare; the so-called chronic type characterized by a swelling of the wattles is more common.

Colds in poultry are common, particularly in growing stock, where overcrowding or improper ventilation or some other fault in husbandry often plays an important part in predisposing to an outbreak. Treatment with sulphonamides has proved very successful, particularly where Heamophilus gallinarum is responsible. Chronic respiratory disease (C.R.D.) is virtually unknown, although infectious sinusitis of turkeys, which has the same causal organism is not uncommon.

Newcastle disease is a scheduled disease and is dealt with under the provisions of the Fowl Pest Order which include compulsory slaughter and payment of compensation. When any other serious infectious disease is diagnosed in the laboratory notification is immediately sent by telegram to the Ministry's field staff; the farm is visited, advice given and the appropriate control measures promptly instituted. By this means many outbreaks are rapidly controlled and the risk of subsequent spread is greatly minimized.

Any review of poultry diseases in Scotland, however short, would be incomplete without some reference to round heart disease. This unusual disease which occurs in many parts of the world has become more common in recent years. It is characterized by the sudden death of what appear to be healthy birds; Leghorns and Rhode Island Reds and their crosses are most susceptible. The characteristic lesion is the greatly altered heart which is egg shaped or barrel shaped and presents a pinkish par-boiled appearance. The cause is unknown. In some outbreaks there appears to be a hereditary basis and the extreme selectivity of the disease is its most striking feature; in others different strains of fowls are attacked indiscriminately. The disease is common in birds on deep litter and the possibility of a nutritional origin cannot be entirely eliminated.



Isolation units and poultry runs at Poultry Laboratory, Lasswade, Scotland.

DISEASES OF CHICKS

The commonest infectious diseases of chicks are bacillary white diarrhea (pullorum disease), salmonellosis, aspergillosis and omphalitis (navel ill or mushy chick disease).

As early as 1929 blood testing of flocks for bacillary white diarrhea was encouraged by the Department of Agriculture for Scotland by giving an additional bonus to participants in their Poultry Improvement Scheme who had their stock tested and in 1931 testing became compulsory. By its organized and continued use in this scheme and in the accredited scheme which superseded it in 1937 a great reduction in the incidence of bacillary white diarrhea was effected. In 1941 the tube test was replaced by the rapid whole blood method which is carried out by the Ministry's field staff. During 1952 the percentage of positive bloods was 0.12 and 881 flocks out of 943 were completely free from reactors.

Outbreaks in turkeys are very rare and almost always associated with contact with infected chicks. No reactors have been found for several years. Until this year the tube test has always been used but now the rapid whole blood method has become the official test.

Infections with other salmonellas, usually S. typhi-murium or S. thompson are not uncommon. Direct egg transmission is rare; infection is usually on the outside of the shell as a result of fecal contamination during egg laying. Many birds with bowel infection do not react to the agglutination test so that the chief method of prevention is the fumigation of eggs either before setting or shortly afterwards with formaldehyde gas. This method is generally successful but when it fails the possibility of direct egg transmission must be considered and recourse may then be made to the agglutination test as an auxiliary method of prevention.

Omphalitis is generally associated with faulty hygiene in the incubator room and aspergillosis is sometimes caused by the use of mouldy or musty hay as a packing for chick boxes.

Coccidiosis, once a serious problem, is still a very common disease but readily controlled by the sulphonamides. Sulphamezathine, sulphaquinoxaline and sulphathiazole are most commonly used.

Newcastle disease, infectious bronchitis and chronic respiratory disease have never been diagnosed in chicks in Scotland.

DISEASES OF TURKEYS

There has been a very considerable increase in the turkey population of Scotland and this has provided an impetus to

further research into disease problems peculiar to this species.

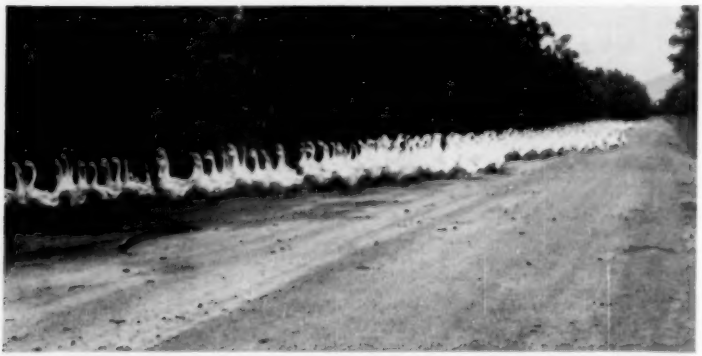
As has been noted earlier bacillary white diarrhea does not present a problem. There are no recorded cases of fowl typhoid and salmonellosis is not common.

Coccidiosis is responsible for losses and outbreaks are sometimes difficult to control as poults are sometimes unwilling to drink medicated drinking water. Sulphaquinoxaline appears to be more palatable than sulphamezathine. With modern methods of treatment now available, blackhead is readily controlled.

Infectious sinusitis is not uncommon but generally responds well to injections of streptomycin and penicillin into the distended sinus. The involvement of the lower respiratory tract presents greater difficulties in treatment.

Infections with Hexamita meleagridis (Hexamitiasis) have occurred within the past few years and although research has revealed hitherto unknown details of the life history and development of the parasite no satisfactory method of treatment has been evolved.

Due to limitation of space this survey is necessarily incomplete. Only the outstanding features have been discussed; no mention has been made of deficiency diseases, parasitic diseases, non-specific diseases nor such interesting conditions as pullet disease or blue comb, visceral gout, and many others. It is hoped however that enough has been written to give the reader a general view of the position.



Two-legged, self-propelled hoe hands used for weeding cotton on the Dean Stahmann Farm in New Mexico. The geese devour the weeds and grass but leave the cotton plants alone. (Photo by Peter J. Hahn, American Cyanagrams.)

SEAWEED AS A POULTRY FOOD

W. A. P. BLACK
Institute of Seaweed Research, Inveresk, Midlothian, Scotland

Although trials on the feeding of seaweed to poultry have, from time to time, been carried out in a number of countries, no definite conclusions can yet be reached as to its true value. This may be due to the fact that the seaweed used has often been cast weed of doubtful origin, which may have undergone bacterial decomposition before it was dried. Like any plant material, the chemical composition of seaweed varies with the species, stage of growth, time of cutting, the locality from which it is collected and its treatment before it is finally a milled product. Seaweed cast in the Spring, for example, when it is actively growing, is high in mineral matter and crude proteins and low in carbohydrates, while in the Autumn the reverse is true. Consequently, there can be considerable differences in the nutritive value of seaweeds. Also, there is always the error incidental to testing a food which only forms a minor portion of the total ration fed.

In Great Britain only two seaweed meals need be considered, (1) "Laminaria Meal," prepared from the brown seaweeds growing below low water, of which *Laminaria cloustoni* is the commonest, and (2) "Ascophyllum Meal" prepared from the common rockweed *Ascophyllum nodosum*. Only the latter meal is available commercially despite the fact that feeding trials with all types of livestock have shown that "Laminaria Meal" is superior to "Ascophyllum Meal."

Summarising briefly the trials carried out in other countries, Miller and Bearse[1] have reported that Manamar, a fish meal-seaweed meal-salts mixture, prevented rickets in chicks but that pure seaweed meal was not a good source of vitamin D. Sumita and others[2] have studied the influence of seaweed meal (4-10% of the basal ration) on the iodine content of hens' eggs and found a marked increase both in the yolks and the whites. Experiments have been carried out in Germany[3] to determine the suitability of "Vithormin K," a mixture containing 65% of *Ascophyllum nodosum*. This was fed for eight weeks in proportions of 5, 10 and 15% to groups of 40 Leghorn chicks but no direct conclusions were possible.

In Canada[4] experiments have been conducted on a large scale with growing chicks and laying hens. The seaweed meal at the levels fed (2½% and 10%) had no effect on mortality, hatchability or body weight. Growing chickens were found to

be able to tolerate up to 10% of seaweed meal in their ration.

In Great Britain trials, under the auspices of the Institute of Seaweed Research, have been carried out at a number of colleges and institutes. Experiments have been carried out at Reading University to determine the level at which seaweed meals could be fed to hens without upsetting their mineral metabolism. Three seaweed meals, two of Laminaria with high and low ash contents and one of Ascophyllum, were tried. Their composition is given in the following table:

	% on dry matter basis		
	L. cloustoni (stipe) A	*L. cloustoni* (frond) B	*Ascophyllum nodosum* C
Crude Protein	10.90	7.44	9.11
Ether Extract	0.47	0.51	2.31
Crude Fibre	10.30	5.65	4.02
Total Ash	34.90	20.10	27.50
Nitrogen-free extract	43.43	66.30	57.06
Calcium	1.78	1.64	1.58
Phosphorus	0.27	0.17	0.15
Chloride	10.04	6.58	5.98

The experimental birds were Rhode Island Red hens, approximately one year old and in full production. Summarizing the results, it can be said that the replacement of 10% of the basal ration by an equal weight of any of the three seaweed meals had no ill effect on the birds; egg production was maintained and the birds remained perfectly healthy. Water consumption increased, however, and there was a marked increase in the chloride content of the droppings. It was found, however, that 20% of seaweed meal, when fed in conjunction with a mineral supplement, upset the metabolism of the birds. These short duration trials (16 days) were followed by a 200-day trial, also with one year old Rhode Island pullets. For the first 100 days 10% of their basal ration was replaced by a similar amount of the seaweed meals. Throughout the period the seaweed meals did not appear to affect the general health of the birds in any way, although the droppings produced by the seaweed fed groups were more liquid than those of the controls, due to the greater intake of water. Egg production and the mean weight of the eggs were comparable, although group B gave slightly superior results to those of all the other groups (81.25% compared with 74.5% for the control). When the seaweed meals were increased to 15% for the second 100 days, greater water consumption resulted with live weight decreases in all cases. Egg production showed a tendency to fall more rapidly in the seaweed groups than in the control group,

this being more pronounced with A and C. From these results it would appear that 10% of seaweed meal is the maximum quantity to introduce into the ration without causing specific effects upon the birds or their egg production. Further, the seaweed meal A, containing the high (34.9%) ash content, appeared undesirable even at the 10% level.

Preliminary trials with day old chicks at the Edinburgh and East of Scotland College of Agriculture have shown that 5% of the Ascophyllum Meal in the basal diet could provide all the vitamin A requirements and part of the vitamin D requirements.

At the National Institute for Research in Dairying, Reading, similar trials have confirmed that 5% of Ascophyllum Meal provided all the vitamin A requirements of the chick and had a marked antirachitic effect. There was a tendency, however, for the seaweed meal to reduce the growth rate of the chicks. Experiments in progress indicate that seaweed meals have also some B_{12} effect when fed to chickens.

It has been found that Ascophyllum Meal can replace the 5% of dried grass meal normally incorporated in battery hen pellets to give the standard yolk color.

Summarizing the results it appears that seaweed can only be used to a limited extent in the poultry ration and at this low level it is very difficult to assess its true value. It is doubtful if seaweed contains anything of benefit not already found in a well balanced diet. It undoubtedly appears to improve the palatibility of the ration and if it can be used to replace 10% of the basal diet it might still have considerable application, particularly in times of shortage.

REFERENCES

1. Miller, M. W. and Bearse, G. E. The Vitamin D Content and Haemoglobin Building Properties of Dehydrated Kelp for Chicks. Poultry Science, 1936, *15*, 19.
2. Sumita, E., A. Kawabata, and Y. Fujioka. The Influence of Kelp Meal Feed on the Iodine Contents of the Hen's Eggs. Pro. 6th World's Poultry Congress (Berlin), 1936, 343.
3. Fangauf, R., and G. von Barlöwen, Deutsche. Seaweed Meal for Chicken Feeding. Wirtschaftsgeflügelzucht, 1953, 5, 46, p. 648.
4. MacIntyre, T. A., and M. H. Jenkins. Kelp Meal in the Ration of Growing Chickens and Laying Hens. Scientific Agric., 1952, *32*, 559.

IMPORTANCE OF THE WORLD'S POULTRY PRODUCTION*

H. ENGLER
F.A.O. Rome, Italy

1. Poultry offers great possibilities of supplying, rapidly and economically, foods rich in protein and vitamins. Eggs and poultry meat are becoming more and more part of the everyday diet, even in countries where certain religious prejudices exist, as in the Far East.

2. Statistics relating to poultry production should be standardized and completed, bearing in mind its economic importance. The number of poultry throughout the world probably exceeds 2 thousand millions. The number of hens per head of population in the United States is 2.9, in the United Kingdom and France 1.8, in Brazil 1.3, in Western Germany 1.0, but it is very low in India (0.09) and many other Oriental countries, as well as in Africa. The average production per hen per year is well over 120 eggs in the United States and in several other countries, but annual production remains at fewer than 40 small eggs per hen in many Asian and African countries.

3. The principal egg exporting countries in 1951 were: Denmark, the United States, Ireland, Australia and France; the principal importing countries in the same year being: Western Germany, the United Kingdom, Italy and Switzerland. China, Australia and the United States exported large quantities of liquid and powdered eggs, with the United Kingdom as the principal importer of these products.

4. The principal exporters of poultry meat in 1951 were: Australia, Argentina, Ireland, the United States, Denmark, New Zealand, the Netherlands, Uruguay, France and Poland. During the same period the principal importers were: The United Kingdom, Israel, Western Germany, Belgium, Italy and Switzerland.

5. It is of interest to give some figures on the total revenue obtained by egg and poultry production in certain European countries: France (1950-51) $600 million (13.5% of

* The following is a summary of a Report prepared by Dr. H. Engler, Poultry Specialist, Agriculture Division, Food and Agriculture Organization of the United Nations (F.A.O.), Rome, for the French "Journées Scientifiques de la Volaille et de l'Oeuf," held in Lyon, 16-18 December, 1953.

total gross agricultural output); Italy (1950) $404.8 million (10.7% of total gross agricultural output); United Kingdom 1951-52) $404.6 million (13.8% of total gross agricultural output); and Belgium (1951) $107.7 million (12.5% of total gross agricultural output).

6. The average prices obtained by producers for 100 kg. of eggs were as follows (1951): Switzerland $122, Greece $107, Italy $98, Denmark $54, France $53, Austria $44 and Turkey $36.

7. In 1951 the price ratio of eggs to coarse grains was favorable to poultry producers in Czechoslovakia, Italy, Switzerland and Greece, but it was unfavorable in Austria, Turkey, Denmark and France. However, better methods of feeding and breeding, which would be followed by increased production, could in part compensate for the relatively high prices of feedingstuffs.

8. According to an estimate of F.A.O., 58% of the world's population received less than 15 grams of animal protein per capita per day during recent years, 24.8% had 15-30 grams, and only 17.2% over 30 grams which is recognized as sufficient. There is a great variation in the average national consumption of eggs: 0.1-1 kg. of eggs per person per year in the Far East; 1-3 kg. in the Near East and in Africa; 2-7 kg. in Latin America; 2-13 kg. in Europe; 12-13 kg. in Oceania; and 17-21 kg. in North America. A large increase in egg production is particularly desirable in those countries where production is at present deficient. Nevertheless, the problem is equally to provide a sufficient supply of feeds and to educate the population in order to increase consumption of eggs and poultry meat, especially in cases where people have less than 30 grams of animal protein per day. Moreover, the improvement in production will be dependent upon price levels and purchasing power.

9. World production of eggs and poultry meat increases less rapidly than do populations. To improve the availability of these products it is necessary to take into account the differences in regional situations. Nevertheless, particular attention should be drawn to the following points:

(a) The fight against poultry diseases should be reinforced on a national and international scale by research, diagnosis, treatment, and by sanitary regulations.

(b) It is most important to cull the inferior birds as early as possible. It is also necessary to increase by

selection and better breeding methods not only average egg and meat production, but also natural resistance to certain diseases.

(c) Feeding of poultry is often insufficient. It is necessary to abolish the feeding deficiencies resulting from the exclusive use of certain feeds produced at the farm, and to reduce wastage.

(d) Both the authorities and the producers, as well as their co-operatives, should give special attention to the organization of collection and marketing of poultry products. It is essential to try to stabilize as much as possible national and international trade.

(e) A strong impetus should be given to research and experimental work as well as extension services. Practical action in order to reduce producers' costs and to increase output and quality is indispensable. Demonstrations on, for example, culling, breeding, feeding, housing, better and cheaper equipment as well as management are often more effective than lectures and publications.

10. The idea that international co-operation is equally indispensable in poultry production as in other spheres has become widespread during the course of the last few years. However, there still remains a great deal to be done in this field.

JULL HALL

The new poultry building at the University of Maryland will be named Jull Hall, in honor of Dr. Morley A. Jull, head of the University's Poultry Department.

Dr. Jull, department head since 1936, has made many outstanding contributions to the poultry industry during the last 44 years. The decision to name the new poultry building in his honor was made by the Board of Regents.

The new building will provide expanded facilities for research, teaching and extension work conducted by the Poultry Department. Since Dr. Jull became department head, the staff has been increased from three to 12 members.

In 1939 a three story office and laboratory building for poultry was built at the University, and two years ago a broiler experiment sub-station was erected at Salisbury, Md. The new building is situated on the north side of the College Park campus.

Before coming to the University, Dr. Jull was senior poultry husbandman for the U. S. Department of Agriculture. During his 13 years in charge of USDA poultry production research, he laid plans for the development and completion of the poultry research unit at the Agricultural Research Center at Beltsville, Md. There he developed the idea of a "family-size" turkey, and initiated the breeding program that led to the variety known as Beltsville Whites.

Dr. Jull is author of four widely used poultry textbooks, and has written many scientific papers in addition to being a frequent contributor to poultry industry publications.

Last year, the Poultry Science Association named Dr. Jull the nation's most outstanding teacher in the poultry field. He had previously been named a Fellow in the association, and served as its president in 1916. He is also a Fellow in the American Association for the Advancement of Science, a member of the executive council of the World's Poultry Science Association, advisory committee of the American Genetic Association, and the Washington Academy of Sciences. His biographical sketch appears in "Who's Who" among American Men of Science.

COMPOST (BUILT-UP) LITTER AS A SANITATION PROCEDURE*

D. C. KENNARD

Ohio Agricultural Experiment Station
Wooster, Ohio, U.S.A.

Until the advent of compost (built-up) litter the conception of sanitation in the brooder and laying houses was mostly limited to the artificial procedures of frequent removal of floor litter, cleaning, scrubbing, spraying, and starting again with fresh litter. In theory this was supposed to be a sanitation procedure for prevention or control of disease. In practice it failed to be effective. It even increased the liability of certain diseases.

Sanitation by definition is any procedure or means (natural or artificial) which aids in the prevention or control of disease. Familiar examples of nature's sanitation in its broader sense, are the chemical and biological activities of the compost heap, modern sewage disposal, and the soil. Likewise compost (built-up) litter is a sanitary procedure by virtue of its chemical and biological activities.

Nature's sanitation procedures need favorable conditions and ample time for effective results. In like manner, there are certain conditions and requirements necessary for compost (built-up) litter sanitation to function properly. This brings us to the question—what characterizes compost (built-up) litter in contrast to other floor litter procedures?

FLOOR LITTER PROCEDURES DEFINED

The three primary floor litter procedures are:

1. *Fresh litter* which involves the removal and renewal of the litter at frequent intervals.

2. *New built-up litter.* All the old litter is removed and each brood of chicks is started on two to three inches of fresh litter followed by additions of fresh litter from time to time. None of the litter is removed before the end of 10 to 15 weeks

---

* *Editor's Note:*—An article appeared in these columns, Vol. 8, No. 4, Oct.-Dec. 1952, p. 293, entitled "Effect of Built-Up Litter On Coccidia and Other Parasites" by W. C. Skoglund. This article was inadvertently misleading, in that it was not stated specifically that Mr. Skoglund's comments were based upon experiments conducted by F. R. Koutz, Ohio State University, Columbus, Ohio instead of by the University of New Hampshire. Dr. Koutz's results were published in Poultry Science 31(1): 123 (1952) and 32(2) (1953). It should be noted that in these experiments the rate of growth of the birds on compost litter with worms was comparable to that of the birds on new litter without worms. Better viabiliy was obtained from the birds on compost litter.

or until a new brood of chicks is to be started. Likewise, each new flock of pullets for egg production is started on three to four inches of fresh litter with additions from time to time without removals.

3. *Compost* (*built-up*) litter which starts with new built-up litter and continues with the use of the same litter for succeeding broods of chicks, broilers, or flocks of layers. To fully realize the sanitation properties of compost litter, it is necessary that the litter be used for two or three previous broods of chicks (20 to 24 weeks) or used by layers not less than six months during which it has become a partially composted back to earth material with a depth of 6 to 8 inches or more. It is during the first six months that the litter acquires its sanitation properties comparable to that which occurs in the compost heap, the soil and in modern sewage disposal.

PREVENTION OR CONTROL OF COCCIDIOSIS

It was as a sanitation procedure that compost litter was first used by the Ohio Agricultural Experiment Station at Wooster in 1945 for the prevention and control of coccidiosis. It proved surprisingly effective. Coccidiosis had long been the principal cause of heavy losses of the Station's chicks during the first 12 weeks. The mortality losses from all causes averaged 19 per cent of the 10 consecutive broods of a total of 18,000 chicks raised on fresh litter during the three years preceding the use of compost litter. After the use of compost litter by Kennard and Chamberlain (1947), (1949a), (1949b), (1951) the losses averaged five percent from 20 consecutive broods of a total of 20,000 chicks raised on the same compost litter in almost continuous use for five years. Similar results have been reported by poultrymen from all sections of this country and from other countries. Consequently after seven years extensive research work and wide use by poultry raisers, compost litter has become widely accepted as a sanitary procedure for the prevention or control of coccidiosis.

PULLORUM ORGANISMS AS AFFECTED BY COMPOST LITTER

More recently the sanitation properties of compost litter with respect to Pullorum organisms were revealed by Botts *et al.* (1952.) Three experiments were conducted with new built-up litter vs. compost litter. The chicks in experiment 1 were given lethal doses of Salmonella Pullorum to contaminate the new and old litter pens. Uninfected chicks were started on the contaminated new and old litters 11 days after removal

of the infected chicks. Twenty-one days after contamination the new built-up and compost litters contained 148,000 and 0 Pullorum organisms per gram respectively.

In experiment 2, a repetition of the first, the contaminated litters contained Pullorum organisms per gram of litter at different time intervals as follows:

	Kind of Litter	
Days after contamination	*New*	*Compost*
2	34,000	22,000
12	790,000	10,500
15*	86,000	0

* Sixty-seven days were required for Salmonella Pullorum organisms to disappear.

Salmonella Gallinarium was the objective in Experiment 3. New litter and compost litter pens were sprayed with lethal amounts of the organisms. Control pens with each kind of litter without contamination were also included. The mortality loss of birds from the new and compost litter pens with and without contamination with Salmonella Gallinarium was 53, 10, and 33, 7 per cent respectively.

The number of Salmonella Gallinarium organisms per gram of litter in the contaminated pens at different time intervals after spraying were:

	Kind of litter	
Days after spraying	*New*	*Compost*
1	6,000,000	210,000
16	2,000,000	30,000
20*	40,000	0

* Salmonella Gallinarium organisms continued to exist in the new built-up litter 63 days after contamination.

Needless to say, these scientific findings are contrary to popular beliefs and assumptions with respect to Pullorum disease and floor litter management. These research results explain why many poultrymen have been able to continue to use their compost litter with no trouble from Pullorum following an outbreak of Pullorum in the preceding brood of chicks.

The evidence now available indicates that compost litter can serve as an effective sanitary procedure against Pullorum organisms. Before this information became available many poultrymen considered it necessary to clean out and sacrifice their available compost litter after an outbreak of Pullorum. Now it is the new litter that is to be feared be-

cause it lacks the sanitation properties to prevent the propagation of Pullorum organisms.

Evidence to the effect that other diseases besides coccidiosis and Pullorum are not transmitted through compost litter from one brood of chicks to another was obtained by Moore and Chamberlin (1953) when the mortality during the first 12 weeks from 880 chicks on compost litter was 4.8 per cent following a 47 per cent mortality of the preceding brood of chicks on the same litter. The high mortality of the preceding brood was mostly due to Newcastle, chronic respiratory disease, coccidiosis, and Pullorum (42 per cent of the birds were Pullorum reactors when tested at the age of 12 weeks). There was an interval of 22 days between broods.

After such a serious outbreak of these diseases, many a poultryman would have considered it necessary to remove the old litter and start the next brood on new litter. That is what Moore and Chamberlin did with 1220 chicks. In the other part of the brooder house, as previously noted, they started 880 chicks on the same compost litter upon which the severe outbreak of diseases occurred with a mortality of 47 per cent of the previous brood. The mortality of the birds on new litter was 9.2 per cent or nearly twice the loss (4.8) of the 880 chicks started on compost litter previously used by diseased chickens.

From these and other results and experiences, poultrymen need not consider it necessary to sacrifice their valuable compost litter because of an outbreak of disease in a previous brood of chicks. To do so may often lead to more trouble and greater losses because of starting the chicks on new litter. By and large, compost litter with its sanitation properties is the safest material upon which chicks can be started and raised.

SUMMARY

The sanitation activities which take place in compost litter are comparable to those of the compost heap, sewage disposal systems, and those of the soil.

Compost litter as a sanitation procedure is most clearly manifested in connection with the growth of chickens during the first twelve weeks when it aids in the prevention or control of coccidiosis and Pullorum disease.

The sanitation properties of compost litter were clearly evidenced throughout the five years of the Ohio Station's extensive experiments which included a total of approximately 20,000 chickens. Likewise, poultrymen from all sections of the country have reported similar results.

REFERENCES

Botts, C. W., L. C. Ferguson, J. M. Birkeland, and A. R. Winter (1952). The Influence of Litter on Control of Salmonella Infections in Chicks. Am. Jour. Vet. Research, Vol. 13, No. 49, October 1952.

Kennard, D. C., and V. D. Chamberlin (1947). Lime Treatment of Floor for Chickens. F.R.H. Bul., Vol. 32, No. 244: 11. January 1947. Ohio Agr. Expt. Sta., Wooster, Ohio.

Kennard, D. C., and V. D. Chamberlin. (1949a). Growth and Mortality of Chicks as Affected by the Floor Litter. Annals of New York Academy of Sciences, Vol. 52, Art. 4: 583. November 1949.

Kennard, D. C., and V. D. Chamberlin. (1949b). Built-up Floor Litter Sanitation and Nutrition. F.H.R. Vul., Vol. 34, No. 261: 162. November 1949.

Kennard, D. C., and V. D. Chamberlin. (1951). Growth and Mortality of Chickens as Affected by the Floor Litter. Poultry Science 30: 47.

Moore, Earl N., and V. D. Chamberlin (1953). Unpublished data Ohio Agr. Exp. Sta., Wooster, Ohio.

SEX-LINKED PLUMAGE COLOR INHERITANCE IN GEESE

In a recent issue of Archiv für Geflügelkunde (XVII. Jahrgang, Heft 7/8, pp. 163-179), Dr. Martin Lühmann, of the Institute for Domestic Animal Science of the University of Kiel, describes results secured from reciprocal crosses between gray geese and white geese. Gray males mated to white females produced light blue-gray sons and gray daughters. On the other hand, white males mated to gray females produced light blue-gray sons and white daughters, results characteristic of a sex-linked cross. These results indicate that the gene giving rise to the deposition of melanic pigment which is responsible for gray plumage color is dominant to the gene for the absence of melanic pigment and the pigment gene is sex linked.

When the F_1 light blue-gray sons secured from the first cross were mated to gray females, the progeny consisted of 1 gray male; 1 light blue-gray male; 1 gray female; 1 white female. When the F_1 light blue-gray sons secured from the first cross were mated to white females, the progeny consisted of 1 light blue-gray male; 1 white male; 1 gray female; 1 white female. (Morley A. Jull, University of Maryland.)

ESSAY COMPETITION—UNITED KINGDOM BRANCH OF THE WORLD'S POULTRY SCIENCE ASSOCIATION

1. Each year until further notice the United Kingdom Branch of the World's Poultry Science Association will offer a prize of books to the value of £10.10. 0. on Poultry Husbandry and cognate subjects approved and supplied by the Executive Committee of the Branch.

2. The following will be eligible to enter:

(a) Students reading for a post-graduate diploma in poultry husbandry.

(b) Students taking a Poultry Diploma course at any Institution approved by the National Poultry Diploma Board for the preparation of students for the examination for the National Diploma in Poultry Husbandry.

(c) Students of Farm Institutes in the United Kingdom taking a specialized course in Poultry Husbandry of not less than one academic year.

3. Three copies of the essay which should not exceed 3,000 words should be submitted in typescript to Major Ian Macdougall, the Secretary, World's Poultry Science Association (United Kingdom Branch) 45 Bedford Square, London, W.C. 1, England, not later than March 31st of any year.

4. The essays will be adjudicated by independent assessors appointed by the Executive Committee of the United Kingdom Branch of the Association.

5. The subject of the essay will be decided annually by the Executive Committee of the Branch.

6. The Executive Committee reserves the right to use these essays, either in whole or in part, in any way they may decide.

The subject of the essay for 1954 will be:

"Discuss the advantages and disadvantages of the intensive and range systems of poultry keeping."

WHEATEN LACED AUSTRALORPS

At the annual conference of the South African Poultry Association held at Port Elizabeth in April, 1953, the Wheaten Laced Australorp bred by Mrs. Myrtle Phillips was officially

recognized as a new variety. This is the third variety which has been bred in South Africa. The White Australorp bred by Messrs. Addison and Jacobs was recognized in 1939, the Golden variety bred at the Agricultural Research Institute, University of Pretoria in 1949.

In the standard the plumage colour of the male is given as beetle green black on the back, wingbow, wing coverts, tail and sickles. The hackle is rust gold and black and the saddle is rich rust gold. The breast is black and the under colour is light grey. The plumage of the female is described as red wheaten on the shoulders, back, saddle and wings. The colour of the hackle is yellow gold and black. The shoulders, back, saddle and wings are red wheaten with black lacing. The wing feathers are dark with shades of wheaten and the under-colour is rich cream. The iris in both sexes is red or reddish brown and the shanks are slate blue.

Sex dichromatism is clearly expressed in this new variety and as in such breeds as the Salmon Faverolle and Brown Leghorn. In the Golden Australorp the colour differentiation of the sexes is not as distinct as in the Wheaten Laced variety. The Golden male has a more prominent golden colour than the female in which the plumage varies from light to lemon buff.

The Wheaten Laced male differs chiefly from the Salmon Faverolle in the amount of gold in the ground colour of the hackle and saddle plumage. In the latter breed the wing feathers are edged or laced with white instead of black with a rusty lacing as in the Wheaten Australorp.

Buff or Gold breeds are genetically black fowls with the recessive ee type of colour restriction. Therefore the Wheaten Laced Australorp male with golden plumage in the dorsal region of the body and the female with a partly golden and rich cream colour can safely be grouped under the gold breeds.

In a cross between Black and Golden Australorps the F_1 females are solid black in colour and the males are black with gold in the hackle and saddle feathers. It is possible to produce Golden Australorps in four generations by crossing the golden and black varieties and backcrossing the progeny to golden sires and/or dams. The colour of the Wheaten Laced may be considered as intermediate between the black and golden varieties but the ovarian hormones which lessen black in the plumage of females, are evidently more active in the Wheaten than golden females. (A. M. Gericke, Pretoria)

ATTEMPTS TO CONTROL FOWL CHOLERA BY MEDICATED FEEDS

C. I. ANGSTROM and JOHN S. SICKLES
Cornell Veterinary College, Ithaca, N. Y., U.S.A.

The following experiments were conducted by the Poultry Disease Diagnostic Laboratory at Kingston, N. Y., to hold down or eradicate mortality from acute cholera.

In the beginning the use of 0.025% sulfaquinoxiline in the water on an intermittent basis reduced mortality, but in time the response to this medication became poorer. Sulfaquinoxiline levels as high as 0.05% in the feed and 0.025% in the water would check mortality but in 3 days or less would result in a severe decrease in feed consumption, egg production, and apparently lowered fertility. Sulfaquinoxiline at the 0.033% level in the diet on a continuous basis was tried. In some pens it was fed in an all-mash breeder ration and in others it was mixed at higher concentrations and fed in a mash-grain system calculated to result in a 0.033% drug intake. These trials and later trials with sulphamethazine and a commercial sulfonamide preparation proved unsatisfactory.

Various other drugs were tried, with and without controls. In one streptomycin was fed at the 250 gram per ton level in an all-mash breeding ration to a divided pen. Treatment did not suppress production, and mortality was about half that in the untreated group.

In another divided pen trial, aureomycin at the 300 gram per ton level was fed. Mortality, though low, was persistent and still due to fowl cholera. Production assumed a more normal rate for this strain of birds and fertility showed an increase to normal, with more vigorous chicks produced. Aureomycin was fed at the 500 gram per ton level, but mortality persisted at a low level, although feed consumption, production, and fertility were high.

An individual pen of birds was treated with 400 grams of Bacitracin and 80 grams of penicillin to each ton of feed for one week. During the following week, half this dosage was used, both levels resulting in a drop in mortality to persistent low levels. At a dosage level of 100 grams of Bacitracin and 20 grams of penicillin, the mortality rose to nearly 2% daily.

A trial with para amino benzoic acid at the rate of 6 pounds per ton of feed had little or no effect on mortality.

In a divided pen trial with furoxone fed at the 100 gram per ton level, results appeared promising in reducing mortality with no apparent effect on production. Later, when fed in 23 pens with as much as 300 grams per ton of feed, 17 pens showed only a low, persistent mortality, while in 6 pens the mortality increased to serious levels.

Terramycin at the rate of 300 grams per ton of feed was fed to three pens of birds and resulted in a decrease in mortality to low, persistent levels, with no apparent effect on production.

Complete control or eradication of fowl cholera was not obtained by any of the materials tried in this outbreak. Several of the drugs, and particularly sulfaquinoxaline, sulfamethazine, and most of the antibiotics had value in temporarily suppressing mortality. In addition, the antibiotics did not have the depressing effect on feed consumption, production and fertility exhibited by the sulfaquinoxiline and sulfamethazine. Therefore, except for the few cases in which mortality seems to be transient and recovery spontaneous, or if sufficient reason justifies otherwise, complete depopulation would appear to be the more feasible method of controlling fowl cholera. (Cornell Feed Service No. 40, August, 1953).

MORE EGGS WITH ANTIBIOTICS

Just mention antibiotics and vitamin B_{12}—that's one of the easiest ways to start a discussion among poultry researchers nowadays.

Most of them agree that chicks need both antibiotics and B_{12} for top growth. There's also evidence that B_{12} in the hen diet benefits chicks, but the carryover influence of antibiotics is questionable.

Somewhat more controversial is the matter of hatchability. Here, vitamin B_{12} apparently is one of several vital factors. Although antibiotics usually give no response, they have sometimes improved hatchability when the breeder diet was low in B_{12}.

Most unsettled area of all is the influence of these materials on egg production. Vitamin B_{12} is generally thought to have no effect. Antibiotics, however, have proved helpful in some trials, worthless in others. ARS scientists R. J. Lillie and J. R. Sizemore hope to find out what's behind these disagreements.

In recent trials, Lillie and Sizemore worked with New Hampshire meat-type pullets. For 7 months after being housed, these birds had been on an all-vegetable-protein diet low in B_{12}. Using trapnest records, the researchers divided the pullets into two classes—those laying above 50 percent, and those below.

Of the low producers, half were continued on the vegetable-protein diet. The other half got the same feed plus 1 percent of a vitamin B_{12} antibiotic feed supplement.

The high producers were broken into four groups. Two were fed the same two rations as the low producers. One group received the base diet with 0.1 percent of vitamin-B_{12} feed supplement. And the last got a feed containing 2 percent fishmeal.

None of these supplements seemed to benefit the high producers. Pullets on the plain vegetable-protein diet laid just as well as the others.

The low producers, on the other hand, responded strikingly to the B_{12}-antibiotic supplement. Production began to climb after 8 weeks. From 12 through 20 weeks, these pullets were laying as many eggs as the birds in the high-producing class—and more than twice as many as low-producers on the unsupplemented diet.

Lillie and Sizemore believe the two classes of pullets differed in ability to use the nutrients in the feed. This suggests such physiological factors as a low level of infection in the poor layers. Whatever the handicap, it seemed to be relieved by the B_{12}-antibiotic supplement.

Further studies are underway. Using pure, crystalline form of B_{12} and antibiotic, the researchers are trying to discover what influence each material has on egg production. These trials will include normal diets and high-producing breeds.

Eventually, some of the confusing results with antibiotics may be traced to differences in environment. Another important point, not well understood originally, is the complex nature of the so-called antibiotic feed supplements. These crude fermentation products are the work of bacteria that make not only antibiotic but also vitamin B_{12} and perhaps still other unidentified growth factors associated with animal proteins. For this reason, many old feeding experiments are being rechecked, and considerable new work must be done. (Agricultural Research, U.S. Dept. Agr., Vol. 2, No. 7)

LEUCOCYTOZOAN INFECTION IN DUCKS

DR. W. R. HINSHAW
Frederick, Maryland, U.S.A.

In studies on epizootiology of *Leucocytozoon simondi* infection in ducks Chernin (*Am. Jour. Hyg.*, 56: 39, 1952) observed that ducks reared naturally on northern Michigan farms seldom suffered from the disease in late June or early July. In contrast, few escaped infection in late July or early August. It was observed that exposure of six-week-old ducklings to natural infection under ordinary farm conditions for eight-day periods in late June or early July failed to cause high rates of infection, and that few infected birds succumbed. When ducklings were exposed during the period from July 11 to August 4, infections were rapidly acquired with high rates of morbidity and fatalities. Exposure after mid-August resulted in no infections.

Also of interest were increased mortality rates of ducklings introduced as transients as compared to indigenous farm birds. The author suggests that indigenous birds exposed to infections early in summer probably received mild infections which rendered them immune to heavier dosages of parasites in mid-summer. From a management standpoint these findings indicate that prevention of excessive mortalities could be accomplished by securing replacements early in the season.

There appeared to be an age resistance factor for ducks 18 weeks of age or older, but not in younger birds. The protection against fatal dosage exposure in the latter appeared to be entirely due to acquired immunity. No difference of susceptibility of sexes was noted. (Veterinary Medicine)

POULTRY RESEARCH ROUNDUP
RHODE ISLAND EXPERIMENT STATION

SUNLAMPS SUPPLY VITAMIN D

A recent research problem at the Station has shown that sunlamps used for short periods each day in the poultry house will furnish enough vitamin D activity for normal growth and calcification. Robert H. Gledhill, graduate assistant in poultry, working with research poultryman S. B. Smith, conducted the tests using 20-watt sunlamps in aluminum reflectors suspended four feet over each feeder. The lamps were

turned on by time clock each day between 8 and 9 A.M. and 3:30 and 4:30 P.M.

Duplicate tests were run with 50 Barred Plymouth Rock chicks to a pen. Two pens were equipped with sunlamps; two pens without sunlamps served as a check. The chicks in the pens with sunlamps were fed a ration practically devoid of vitamin D while the ration of the check pens contained 204 international units of vitamin D3 per pound.

Gledhill and Smith report that the birds in the sunlamp pens gained just as well and utilized their feed just as efficiently as the control birds.

Vitamin D can be produced in the body of animals by the action of certain light rays — ultra-violet rays of certain lengths. This test shows that common sunlamps emit enough light of the right wave lengths to supply vitamin D activity.

Since most commercial poultry rations now carry readily available vitamin D compounds—such as fish liver oils or irradiated animal sterols—it is doubtful if installation of sunlamps in the average poultry house for stimulation of vitamin D activity would be practical. However, the knowledge that sunlamps will stimulate vitamin D activity may prove a useful research technique in the current search for the hidden elements of feed ingredients.

NEW DIAGNOSTIC TEST DEVELOPED

A convenient and accurate procedure for determining the individual immunity of chickens to Newcastle disease has been developed by members of the department of animal pathology, Vance J. Yates, Bernard Wasserman and Dorothy E. Fry. The test is a definite aid in diagnosing respiratory infections.

The method involves a specially adapted strain of a Newcastle disease virus (New Jersey Roakin). This special skin-adapted strain when injected intradermally has the ability to produce consistent and extensive skin lesions in birds susceptible to Newcastle disease—and only in these Newcastle disease susceptible birds.

As a diagnostic aid, it can be used to determine whether a chicken showing respiratory symptoms is sick from Newcastle disease or some other respiratory ailment. Birds showing respiratory symptoms may be skin tested and if a lesion develops, it can be assumed the bird does not have Newcastle disease; if a lesion does not develop, the bird is likely suffering from or has had Newcastle disease in the recent past. (Research Quarterly Review, Vol. 4, No. 2, Rhode Island Agr. Exp. Sta.)

MORE EGGS, LESS WORK—NEW FEEDING METHOD

J. W. KELLY, E. W. GLAZENER, and W. L. BLOW
North Carolina Agr. Exp. Station, Raleigh, N. C., U.S.A.

An easy method of feeding grain to layers, new to North Carolina, has given three per cent more eggs with lower feed costs and easier work.

It's called the free-choice method, because the hens have free access to hoppers of corn and oats, plus an experimental 26 per cent laying mash. Ordinarily scratch grain of corn, wheat and oats is fed daily by hand—all that the birds will consume in about 30 minutes in late afternoon—and birds have a 20 per cent protein mash available free-choice constantly. Most North Carolina farmers follow this latter mash and grain method.

This method has given good results at the Coastal Plain Station for many years. But it means that someone must stay at home to dole out the right amount of grain mixture each day, and this takes skill and good judgment because it varies with the number of birds as well as weather conditions.

Since about 1950 Tar Heel poultrymen have become interested in the free-choice method of feeding separate grains with a laying mash concentrate. In the large grain producing areas farmers have used this method for some time.

NEW METHOD TESTED

To test free-choice feeding under North Carolina conditions, we carried out two tests. Trial 1 consisted of placing one pen of 124 Rhode Island Red pullets and 10 cockerels from the Station breeding flock on each method of feeding and keeping records from February 1 to August 1, 1951. Trial 2 was similar with records from November 1, 1951, to August 1, 1952.

The pullets were kept in two pens in the same house allowing four square feet of floor space per bird. Each pen had four feed hoppers providing 3.4 inches of feed hopper space per bird. The birds were not culled during the study.

The control pen for each trial received a 20 per cent protein breeder mash. The formula for the 26 per cent protein breeder mash, mixed according to State College directions by Statesville Flour Mills Co., is given in Table 1.

In the control pen, the 20 per cent mash was kept in four hoppers at all times. In late afternoon the birds were hand-fed all the grain mixture they would clean up in 20 to 30

TABLE 1

26% Protein Breeding Mash Concentrate—in Pounds	
Ground yellow corn	19
Standard wheat middlings	15
Meat scraps (55%)	13
Fish meal (60%)	10
Soybean oil meal (41%)	15
Dehydrated alfalfa meal (17%)	15
Dried fermentation solubles 500 micrograms riboflavin per gram	2
Steamed bone meal or defluorinated rock phosphate	7
Salt	2.5
Feeding oil (400D, 2000A)	1.5
Manganese sulfate	0.05
Total lbs.	100.05

minutes. The mixture included 70 pounds of corn, 20 pounds of wheat and 10 pounds of oats, all whole grain.

In the free-choice pen, the 26 per cent mash was kept in two hoppers all the time. The birds also had constant access to one hopper of whole yellow corn and another of whole oats. The birds could choose their own mash and grain at will in this pen.

In both pens, crushed oyster shells and granite grit were kept in separate containers.

MORE EGGS FROM FREE-CHOICE

You'll find the results on egg production and feed consumption by the different feeding methods in Table 2. Records for April, 1952, were excluded because of an error in shipment of mashes.

The birds on 26 per cent protein mash averaged 2.8 and 2.7 percent more eggs than the control birds. This difference is large enough so it is due to the different feeding methods, not just to chance. In these trials this difference amounts to 9 or 10½ dozen eggs per month in favor of the free-choice feeding pen.

Also, the free-choice birds ate 7.5 and 13.3 pounds less mash per bird for the two trials, but on the other hand they ate 8.9 pounds more grain per bird the first year and 14.7 pounds more the second year. These results agree generally with those from other states.

Some poultrymen contend that if you feed grain free-choice, the birds will eat too much, get too fat and thus lay fewer eggs. Results of these tests show differently, whether you compare total feed per bird, per cent egg production or average body weight. In each case results favored the free-

TABLE 2

Effect of Method of Feeding on Egg Production

Method of feeding:											
Months	Free-choice Mash	Grain	Percent egg production†	Mash per bird lbs.	Grain per bird-lbs.			Total feed per bird lbs.*	Av. weight of birds Aug. 1st lbs.	Percentage of ration from	
					Mixture	Corn	Oats			Mash	Grain
Feb.-July 1951	20% Protein	Grain mixture hand-fed	47.3	21.7	32.3	—	—	54.0	6.0	40.2	59.8
	26% Protein	Grain mixture free-choice	50.1	14.2	—	20.4	20.8	55.4	6.1	25.6	74.4
Nov.-July 1952 Excluded April	20% Protein	Corn and oats hand-fed	58.7	31.9	41.9	—	—	73.8	5.8	43.2	56.8
	26% Protein	Corn and oats free-choice	61.4	18.6	—	25.8	30.8	75.2	5.9	24.7	75.3

† Hen-day basis—no culling * Feed males consumed charged to females

choice feeding method or were too small to mean anything.

Research in other states has shown that chickens eat mash according to protein content if you let them select their grain and mash at will. In North Carolina trials it was estimated that birds on the 26 per cent mash would select their own ration on the basis of one part mash to three parts grain—that is, 25 per cent mash and 75 per cent grain. Results turned out almost exactly that way. As for birds on 20 percent mash, you'd expect them to eat a bit more mash, and they did—about 40 per cent of their total feed was mash in both trials.

FREE-CHOICE METHOD FAVORED

Thus, despite differences in egg production and seasonal variations from year to year, the share of ration coming from mash was rather consistent. Under these conditions and from the standpoint of feeding home grown grains, the free-choice method obviously is favored over the control method of hand feeding.

To figure costs of producing a dozen eggs by both methods of feeding, we used prevailing prices of farm grains and mashes. On this basis, the feed cost per dozen eggs averaged from 2.7 to 3 cents less for the birds fed free-choice.

Extensive studies have not been made on hatchability of eggs from birds fed free-choice. But data to date apparently show little difference in hatchability between the two groups.

Instead of the specially-mixed 26 per cent mash used in the study, most feed dealers have a 30 to 32 per cent protein laying mash. But it's more economical to feed a 26 per cent mash with whole grain as recommended. This is true because the birds waste less protein over the amount needed, since they can balance their mash and grain intake more nearly to requirements.

IN A NUT SHELL

In summary then, here are the advantages of free-choice method:

1. A poultryman needs no skill to place grains in the hoppers and let the birds select and balance their own ration. Each bird can feed itself according to production requirements.

2. If you have land for raising grain, you can produce 75 per cent of the laying ration right at home.

3. You don't need to mix any scratch grain.

4. You don't have to stay at home to feed the flock grain every afternoon.

As for disadvantages:

1. By eating grain from hoppers, birds have little incentive to scratch and turn the litter so it may tend to pack and cake. You can usually get around this problem by scattering only a few handfuls of grain in the litter once or twice a week.

2. This method of feeding does not appear to be adaptable to automatic chain feeders.

3. Egg yolk color might be more variable by this method than by the all-mash method. (Research and Farming, Vol. XI, No. 2, North Carolina Agr. Exp. Sta.)

LYMPHOMATOSIS RESEARCH YIELDS SIGNIFICANT RESULTS

Research at the United States Regional Poultry Research Laboratory, East Lansing, Mich., has shown that visceral lymphomatosis, or the so-called big-liver disease, is caused by a virus or a viruslike agent. Furthermore, this abnormal growth or neoplastic condition of the visceral organs is malignant, i.e., it is comparable to cancer in man. No possibility is overlooked on the part of investigators of human cancer to obtain more information about the cancer process. This ac-

counts for the fact that the National Cancer Institute has supported cooperative research at this laboratory.

Although little has been said in previous reports about the visceral form of lymphomatosis being a malignant disease, scientists and leaders of the poultry industry should be aware of this fact. Because of its malignancy, this disease is regarded by authorities as the most difficult of all livestock (including poultry) diseases to control and eliminate.

Research at the laboratory has shown that the visceral form of lymphomatosis is transmitted directly from the parent to the offspring by way of the hatching egg. The conclusions of other investigators that the disease is spread also by contact has been confirmed. The results indicate that apparently healthy chickens may harbor the disease and infect their offspring. Until such time as research can develop a test to identify "carrier" birds, poultrymen and hatcherymen should not be held responsible for the spread of infection through chicks. Much additional research must be done to determine the extent of infection of hatching eggs, how the disease is spread by contact, and how the virus or agent may be destroyed in the incubator and elsewhere.

This laboratory was the first to demonstrate that highly successful transmission of the disease by inoculation is largely dependent upon the age of the chicks. Resistance to infection increases rapidly with age. These results have great significance with respect to transmission of the disease. Many weeks or even years are required after the first infection for the cancerous tumor to appear. This information is of special importance in the interpretation of results obtained in experimental work.

The laboratory has also demonstrated that visceral lymphomatosis may be spread to healthy chickens by those that have been given the disease by inoculation. In this respect, our experience is different from that of investigators working with malignant diseases in other experimental animals.

A rigid sanitation and quarantine program which completely eradicated infectious bronchitis from the premises, had little, if any, effect on the incidence of lymphomatosis in succeeding populations of chickens.

The White Leghorn chickens hatched in 1951 represent the first group of birds raised after the renovation that followed the outbreak of bronchitis. In experiments on breed-

ing for susceptibility and resistance to lymphomatosis last year, the amount of lymphomatosis in birds up to 400 days of age in the inbred lines was relatively low except in susceptible Line 15. The chicks in these experiments had no opportunity to come in contact directly or indirectly with older chickens.

RESPONSE OF CHICKENS TO INOCULATION WITH FILTRABLE AGENT OF LYMPHOMATOSIS

In a study of the relation between resistance to the filtrable agent of visceral lymphomatosis given by inoculation and to the naturally occurring disease, 10 to 22 chicks in each of 34 families were inoculated intraperitoneally with filtered inoculum prepared from tumorous livers of birds in the serial passage of Strain RPL-12. The 34 families were distributed among 4 inbred lines and 3 first-line crosses. The average incidence of visceral lymphomatosis in inoculated birds was 33 percent at 310 days; in the noninoculated sisters the incidence at about 500 days of age was 13.9 percent. The coefficient of correlation of the incidence of lymphomatosis between inoculated and noninoculated naturally infected sibs was highly significant. Likewise, the correlation calculated on the basis of lines and crosses was highly significant. These data indicate that inoculation with the filtrable agent of visceral lymphomatosis may enable more stringent selection in the development of lines of birds resistant to naturally occurring lymphomatosis. (Bureau of Animal Industry, U. S. Department of Agriculture)

POULTRY RESEARCH INVESTIGATIONS AT THE NORTHERN IRELAND AGRICULTURAL RESEARCH INSTITUTE, HILLSBOROUGH, COUNTY DOWN

Antibiotics in chick growth: Further experimental work has been carried out employing procaine penicillin. In one experiment, where female chicks were making poor liveweight gains, a response of 20 per cent was obtained by antibiotic addition. This work has now been extended to establish the value of antibiotic addition to cockerel fattening diets, since it is likely that it is only in the case of intensive table poultry production that antibiotics will be of significance in poultry husbandry.

Sunflower cake meal for laying hens: (with R. W. Hale). The experiment reported last year is being repeated with pullets hatched in 1952. In the 1951-52 experiments sunflower meal gave comparable results to fish meal as regards egg production at the high and low protein levels in the diet, but the body weight of the sunflower-fed hens was not maintained during the laying season.

Riboflavin: A group of Light Sussex hens has been maintained on a riboflavin-deficient diet in one of the wire-floored houses to produce hatching eggs of low riboflavin content for the study of the transfer of the vitamin to the embryo during development.

Two further groups of hens were maintained on an all-vegetable diet in wire-floored houses to produce chicks deficient in the animal protein factor.

Vitamin B_{12}: An experiment was carried out under group feeding conditions on the effects on total body composition of the administration of dietary B_{12} to chicks deficient in the animal protein factor.

Effect of ultra-violet light on egg production: Work carried out in the U.S.A. has indicated that an increase in egg production can be obtained in two-year-old hens as a result of irradiation with light of short wavelength. Two groups of 150 Light Sussex pullets, kept under deep litter conditions, were used from December to March to study the possible effect of bactericidal light on egg production.

CROSSBREEDING IN POULTRY

All types of crossbred pullets tested in poultry breeding trials at the Commonwealth Scientific and Industrial Research Organization, Poultry Research Centre at Werribee, Victoria, Australia, in 1952, again proved superior to their pureberd parent types in egg production according to a progress report issued by C.S.I.R.O. (Sept. 16, 1953)

Production records are now available for five generations covering in addition to pure breeds the following types of crossbreds:—Single crosses between White Leghorn cockerels and Australorp hens, and the reciprocal cross; three-way crosses obtained by mating Rhode Island Red cockerels to crossbred hens from White Leghorn and Australorp parents; and rotational crosses or "criss-crosses" obtained by mating White Leghorn or Australorp cockerels alternating the breed each year, to crossbred hens from earlier matings between these breeds.

During each of the five years, 1948 to 1952, crossbred pullets produced on the average approximately 18 more eggs per bird than the best purebred flocks from which their parents had been chosen without special selection. The best performance was recorded in 1952, when the average production of 83 single-cross pullets, obtained by mating two White Leghorn cockerels with 27 Australorp hens was 231.6 eggs per bird during the Standard Pullet Year (from their first egg to 31st March following). The average annual production from flocks of unculled crossbreds over the five-year period have been:— 216 eggs from single-cross pullets, 210 from three-way pullets and 214 from "criss-cross" pullets.

In certain tests, selected purebred males were used both for the production of purebred and crossbred progeny. The progeny consisted of 212 purebred and 397 crossbred pullets. The purebreds produced 174 eggs and the crossbreds 219 eggs per bird in the first laying year, that is, 45 eggs more than their purebred half-sisters.

There were no significant differences in production between the various types of crosses. As a rule it can be stated that the more productive the parents the higher the production level of the crossbreds. As the cock normally has about 10 times as many daughters as has a single hen, the selection of the sire to be used in crossbreeding is of the greatest importance. In practice it is less difficult to obtain a White Leghorn cockerel with high production backing than an Australorp, and for this reason the progeny of a cross using the White Leghorn sire are usually superior to the reciprocal cross.

Although the various crossbreds tested are equally productive the rotational system has important economic advantages. Only a small number of good sires are required and these may be obtained by purchase. This contrasts with the need to maintain a purbred flock to provide cocks and hens when single and three-way crosses are desired. Again, the crossbred dams which are used for breeding, lay more eggs than purebreds and thus the reproductive rate is higher.

Hybrid vigour also effects important characters in addition to egg production. It has been observed at the Poultry Research Centre that hatchability and rearability are better in crossbred poultry and that they have a lower mortality rate than purebreds. Experiments are in progress to determine if further improvement can be obtained by breeding from parents from strains specially selected on the basis of higher production of their crossbred progeny. (F. Skaller)

RATE OF GROWTH IN CHICKENS

F. P. JEFFREY

Poultry Department, University of Massachusetts
Amherst, Mass., U.S.A.

One of the most striking advances in poultry technology during recent years has been the increase in rate of growth of chickens. This point is well illustrated when comparing growth rates as observed in 1932 with those of 1953. The following table is based on data published in Cornell Bulletin 240 (1932) and New Hampshire Bulletin 401 (1953). Growth and feed conversion figures in the 1932 data were based on American breed cockerels whereas those of 1953 were taken on New Hampshire cockerels.

	Live body weight in		*Feed conversion in*	
Age in weeks	*1932*	*1953*	*1932*	*1953*
2	.19	.38	1.5	1.3
4	.46	.97	2.1	1.8
6	.96	1.62	2.4	2.2
8	1.55	2.58	2.7	2.4
10	2.09	3.64	3.1	2.6
12	2.80	4.49	3.3	2.9
14	3.57	5.63	3.4	3.2
16	4.02	6.64	3.9	3.7
18	4.63	7.26	4.2	4.1
20	5.01	7.44	4.5	4.7

In 1932 it required 20 weeks and 23 lbs. of feed to produce a 5 lb. fryer whereas today 5 lb. fryers are being produced at 13 weeks of age and require only 16.5 lbs. of feed.

It is an understatement to indicate that producing 5 lb. fryers in 35 per cent less time and on 28 per cent less feed represents considerable progress in 20 years.

This remarkable improvement in growth rate can be attributed mainly to research done in two major fields—nutrition and genetics. I am inclined to feel that nutrition workers have made the biggest contribution but the private poultry breeders have also made substantial progress and maximum growth today is realized only when good stock is fed good feed.

Good management and control of disease are just as important today as they were in 1932 but it is doubtful if birds get better care today than they did in 1932. Certainly the grower today has more diseases to contend with than he did in 1932 and it must be pointed out that our modern poultry meat industry would not be possible without the contributions made by poultry pathologists. (Featheredfax)

REVIEW OF POULTRY PUBLICATIONS

Compiled by J. W. Kinghorne

1365 Iris St., N.W.

Washington 12, D.C., U.S.A.

GENETICS

BLYTH, J. S. S. (Poultry Res. Centre, Edinburgh.)
MARCH EGG NUMBER IN INBRED AND FIRST CROSS BROWN LEGHORNS. *Heredity 7:* 23-30. 1953.—Two isolate inbred lines of the flock were cross-mated in 5 different yrs. The superiority shown by the crosses over the parental types rests on 2 kinds of variation in egg numbers: (a) a basic maximum rate or rhythm, and (b) interruptions in the sequence of laying, constituting divergencies from this rhythm. The basic rate equalled, but did not exceed, that of the higher producing line. The proportion of cross birds pausing for more than 4 days were small and provided a source of distinction from both inbreds. A previous deduction that there were differences in the incidence of pausing between inbred lines now appears to have arisen from an artifact deriving from the criterion of classification used, but re-examination of the data still suggests that the proportion of pausing birds in them has increased in recent yrs.—*J. S. S. Blyth.* (Biological Abstracts)

JEROME, F. N., and J. E. BERGEY. (Ontario Agric. Coll., Guelph, Canada.)
WING SPOT: A DOWN CHARACTER IN DOMESTIC FOWL. *Poultry Sci 32:* 412-414. Illus. 1953.—The character, wing-spot, is manifested as a white spot located on the dorsal surface of the wing of some black-downed breeds. A number of crosses proved the character to be due to a pair of recessive autosomal genes.—*F. N. Jerome.* (Biological Abstracts)

KISH, ALADAR F. (U. Delaware, Newark.)
THE INHERITANCE OF BREAST WIDTH IN A STRAIN OF NEW HAMPSHIRES. *Poultry Sci. 32:* 197-202. 1953.—Individual breast-width measurement at broiler age serves as an effective base for breeder selection in a program for improvement of breast width. The male parent exerts a greater influence upon the breast conformation of the progeny than does the female parent. The detn. of breast width with vernier calipers, approx. one inch posterior to the cranial process of the sternal crest at a distance one-half inch dorsal to the crest, appears to be an acceptable technic.—*Auth. summ.* (Biological Abstracts)

MOULTRIE, FRED, D. F. KING, and G. J. COTTIER. (Agric. Expt. Sta. Alabama Polytech. Inst., Auburn.)
FIFTEEN YEARS OF SELECTION FOR VIABILITY IN WHITE LEGHORNS. *Poultry Sci. 32:* 454-461. 1953.—In an environment with severe exposure to pathogenic agents, a strain of White Leghorns selected concurrently for viability and superiority in other productive traits has shown a decrease in adult mortality of unculled pullets from 89% in 1935 to 14% in 1950. During the same period, mortality due to leucosis decreased from 58.7 to 3.7% of pullets housed. Accompanying the increase in livability was an increase in 1st-year egg production (pullet-housed basis) from 64 eggs per bird in 1935 to 195 eggs

per bird in 1950. In 3 yrs. of performance tests utilizing 10 local (Alabama) strains (1946 and 1947) and 4 outstanding U.S. strains (1948), the strain selected for viability (Auburn) excelled the avg. of the introduced strains in livability by 34%, 29%, and 30%, respectively. On a pullet-housed basis, the resistant strain excelled the introduced strains in egg production during the 3 yrs. of the performance tests by 72, 36, and 45 eggs per bird, respectively.—*Fred Moultrie.* (Biological Abstracts)

SCHEINBERG, S. L., HELEN WARD, and A. W. NORDSKOG. (Iowa State Coll., Ames.)
BREEDING FOR EGG QUALITY. I. HERITABILITY AND REPEATABILITY OF EGG WEIGHT AND ITS COMPONENTS. *Poultry Sci. 32:* 504-510. 1953.—Data from the poultry flock maintained at the Iowa Agric. Expt. Station during 1947-1948, involving total egg wt., total albumen weight, and yolk measurements on 1051 eggs, were analyzed to determine the causes of variation of these measurements. Heritability and repeatability estimates were obtained for total egg wt. and its components. Heritability estimates ranged from .33 to .56 for total egg wt.; from .12 to .68 for total albumen wt. and from .0 to .12 for yolk wt. Repeatability estimates ranged from .67 to .76 for total egg wt., 0.29 to .70 for total albumen wt. and .40 to .68 for yolk wt. A satisfactory measure of the inherent egg wt. of a hen may be obtained by weighing from 6 to 10 eggs per hen.—*A. W. Nordskog.* (Biological Abstracts)

SHULTZ, FRED T. (U. California, Berkeley.)
CONCURRENT INBREEDING AND SELECTION IN THE DOMESTIC FOWL. *Heredity 7:* 1-21. 1953.—The genotype is interpreted as an integrated complex arising during the course of evolution under natural selection acting on an essentially heterozygous system. In populations in which natural selection, artificial selection, and inbreeding are acting, changes in the genetic composition will occur until an equilibrium between these forces is reached. Data from eight inbred lines under selection and their crosses furnish three illustrations, (1) the arresting of the inbreeding degeneration in November egg number by natural selection for fitness, (2) balance between artificial selection for high November egg weight and the contrary forces of natural selection and inbreeding, and (3) counterbalancing of artificial selection for low egg weight and inbreeding depression by natural selection for a higher optimum level. The manifestation of genetic homeostasis as a negative correlation between reproductive fitness and selection for egg weight, both high and low, was demonstrated. Instances were noted in which gains from selection for high egg weight, high egg number, and low egg number were cryptic due to the effects of inbreeding.—*Author.* (Biological Abstracts)

STEPHENSON, A. B., A. J. WYATT, and A. W. NORDSKOG. (Iowa State Coll., Ames.)
INFLUENCE OF INBREEDING ON EGG PRODUCTION IN DOMESTIC FOWL. *Poultry Sci. 32:* 510-517. 1953.—The effect of inbreeding on egg production rate was studied using the records of 9999 White Leghorns at Iowa State College from 1932 to 1946. The birds were classified into 23 inbred and 3 "non-inbred' 'lines. Several of the lines were actually related sublines. Full-sib and half-sib matings were generally practiced. The inbreeding coeffs. ranged from zero to 85%. Pullet year egg production was divided into 3 periods according to season. Inbreeding influenced egg production rate similarly in each of these 3 periods. Differences in egg production among the inbred lines were significant. The line x year interaction was also significant as were differences among yrs. The effect of inbreeding on egg production was linear after the inbreeding coeff. exceeded 25%. The specific line regressions of egg production rate on inbreeding coeff. were found to be significantly different from the general regression. The general regression was found to be —.43 ± .04 where both variables were expressed as percents. Inbreeding is a much stronger force than selection in influencing egg production.—*A. W. Nordskog.* (Biological Abstracts)

WYATT, A. J. (Iowa State Coll., Ames.)
COMBINING ABILITY OF INBRED LINES OF LEGHORNS. *Poultry Sci. 32:* 400-405. 1953.—Topcrosses were made using sires from inbred lines of Leghorns. Five female testers were used. Each was a single cross of inbred lines of heavy breeds. The performance of the topcross progeny was compared with that of the Leghorn inbreds, and data were analyzed for body wt., hatchability, mortality, egg production, and egg wt. Significant line x tester interactions were obtained for body wt. at 8 weeks and for hatchability. Evidence is presented which indicates that differences between the lines in this study are primarily the result of effects other than those due to additive genes. These data indicat only a limited value of the topcross test for evaluating combining ability of inbred lines.—*A. J. Wyatt.* (Biological Abstracts)

AGCAOS, PABLO B. (Bureau of Animal Industry, Manila, Philippines.)
THE BARRED PLYMOUTH ROCK CHICKENS. *Philippine Jour. Anim. Indus. 12 (1-4) 33-38.* 1951.—A report on the performance of the 12 pedigreed Barred Plymouth Rock pullets and two cockerels received from the Dryden Poultry Breeding Farm, Modesto, California, on November 19, 1949. These birds were seven months and 26 days old then. Their dams produced from 273 to 327 eggs a year and these eggs weighed from 23.7 to 27.8 oz. per dozen. The imported pullets from these dams produced from 160 to 289 eggs or an average of 219.33 eggs for a year's record. These eggs weighed from 19.76 to 24.24 oz. per dozen. The average hatchability of these eggs was 84.97 per cent and chicks weighed an average of 42.63 grams. The sexual maturity of the F_1 generation was six months and 28 days.—*F. M. Fronda.*

PHYSIOLOGY

AGCAOS, PABLO B., and TOMAS V. RIGOR. (Bureau of Animal Industry, Manila, Philippines.)
OBSERVATIONS ON THE IMPORTED S.C. WHITE LEGHORN AND NEW HAMPSHIRE CHICKS UNDER ALABANG CONDITIONS. *Philippine Jour. Anim. Indus. 12 (1-4) 13-18.* 1951.—These observations were made on 3,113 S.C. White Leghorn and 3,138 New Hampshire sexed baby chicks delivered in three air express shipments by the Howard Poultry Farm, Rio Linda, California. The shipping mortality was 8.19 per cent in the S.C. White Leghorn and 9.04 per cent in the New Hampshire and the mortality during the first 7-day period of their lives was 11.72 per cent and 13.89 per cent. The sexed baby chicks were 98.99 per cent pullets in the S.C. White Leghorns and 99.31 per cent in the New Hampshires. The sexual maturity of these pullets varied from four months and twenty-one days in the first shipment to five months and twenty-seven days in the third shipment (average five months and ten days) in the S.C. White Leghorn and from four months and ten days to six months and two days (average five months and twelve days) in the New Hampshire.—*F. M. Fronda.*

AUBER, L., and H. M. APPLEYARD. (Wool. Indust. Res. Assn., Leeds.)
SURFACE CELLS OF FEATHER BARBS. *Nature 168(4278):* 736-737. Illus. 1951.—Polyvinyl acetate pressure casts of the barbs of Guinea fowl, "Silky" fowl, and *Chlorophanes* showed a network of polygonal cell boundaries with a lengthwise trend, each with an oval area for the nucleus. Coarse longitudinal striations correspond to the impressions of the underlying longer cortical cells; there is also a fine pattern of obliquely interlacing fibrillary structures.—*Roland Walker.* (Biological Abstracts)

BOLTON, W. (Poultry Res. Center, West Mains Rd., Edinburgh 9.)
OBSERVATIONS ON THE VITAMIN METABOLISM OF THE COMMON FOWL. I. THE PARTITION OF FREE AND COMBINED RIBOFLAVIN IN THE TISSUES OF THE LAYING HEN. *Brit. Jour. Nutrition 6:* 71-75. 1952.—Partition of riboflavin into the free vitamin,

flavin-mononucleotide (FMN) and flavin-adenine-dinucleotide (FAD) was dtd. in the magnum (where the egg yolk receives its albumen) and the sheil gland, and checked against the liver, kidney and heart. The magnum showed 1.5 times as much free riboflavin as FMN and 3 times as much FMN as FAD, while the shell gland had 75% of the total riboflavin present as FAD. The author suggests that the magnum secretes the riboflavin with the albumen, and passes it to the egg from day to day with the albumen. The liver, kidney and heart contain even more riboflavin in the FAD form (85%) than the oviduct glands.—*J. E. Oldfield.* (Biological Abstracts)

BURROWS, W. T., and I. L. KOSIN. (State Coll., Washington, Pullman.) THE EFFECTS OF AMBIENT TEMPERATURE ON PRODUCTION AND FERTILIZING CAPACITY OF TURKEY SPERMATOZOA. *Physiol. Zool. 26:* 131-146. 1953.—Broad breasted bronze turkey males selected at random were divided among three pens—an insulated pen maintained at 65° ± 50F; an uninsulated, single-walled pen with a ceiling and without windows; and an outside pen with an open-side range shelter, walled on the windward side, as the only source of protection. Regular collections of semen from each pen were examined for pH, numbers of spermatozoa, kinds and proportions of malforms, and the percentage of semen volume represented by spermatozoa. Hens, all in one pen, were divided into 3 lots, with each lot assigned to 1 pen of males. The hens were inseminated at regular intervals with pooled semen from their respective pens of matse. Throughout the period under investigation, the hens received 13 hrs. of light daily, but the males received only the number of hrs. of artificial light equal to that of normal day length. The effect of the semen of each pen of males on the fertility and hatchability of eggs laid by these hens was detd. These results were obtained: (1) in general, the pH values of the semen rose from winter through summer; (2) the number of spermatozoa per ejaculation was reduced as a result of the exposure of male birds to extreme cold; (3) the use of the percentage value of volume of semen represented by spermatozoa as an estimate of the number of spermatozoa per sample was unreliable; (4) no significant seasonal or temp. trends existed in the kinds and/or numbers of malformed spermatozoa as detected by subjective analysis. (5) the fertilizing capacity of the semen of males maintained in a "comfortable environment" was significantly greater than that of males partially protected or wholly unprotected from temperature fluctuations; (6) the time of year at which semen of high fertilizing capacity is produced may be materially advanced by the use of heat. (7) temp. maintained at a "comfortable" level does not extend the period of production of semen of high fertilizing capacity. (8) While apparent differences in hatchability may be in part due to the effect of the treatments on the spermatozoa, the statistical significance obtained here must be considered with caution.—*Authors.*

COLE, R. K., and F. B. HUTT. (Cornell U., Ithaca, N.Y.) NORMAL OVULATON IN NON-LAYING HENS. *Poultry Sci. 32:* 481-492. Illus. 1953.—Close observation and dissection of more than 200 mature but non-laying White Leghorns revealed that a majority possessed normal, fully developed, and apparently functioning reproductive systems. The proportion of such non-layers in the populations ranged from 0.3 to 2.9% in 4 successive yrs. They had been ovulating frequently but were quickly resorbing the yolk material from the body cavity. These rather obese individuals showed external signs of being in full production, including bleaching of the pigment, pliable condition of the skin, and fullness of the abdomen, as well as the general appearance of the head. They also went frequently into the trapnests, as if to lay. No obvious cause for the failure of these birds to produce eggs was recognized, although there was some evidence (from differences among strains and sires) that genetic factors were involved. In some other cases a faulty development of the oviduct (discontinuity of the lumen and secretory epithelium) made egg formation impossible. These birds also were ovulating and nesting. Mortality among the non-layers, due to disorders associated with reproduction as well as to other causes,

was considerably higher than in their normal laying pen mates. Obviously it is not possible to identify all non-layers by physical inspection. Neither is it correct to assume that normal-appearing trap-nested birds without egg records are laying on the floor.—*Auth. summ.* (Biological Abstracts)

COMMON, R. H., W. A. MAW, and J. R. JOWSEY. (Macdonald Coll. P. O., Quebec.)
OBSERVATIONS ON THE MINERAL METABOLISM OF PULLETS. IX. THE EFFECTS OF ESTROGEN AND ANDROGEN ADMINISTERED SEPARATELY ON THE RETENTION OF CALCIUM BY THE SEXUALLY IMMATURE PULLET. *Canadian Jour. Agric. Sci. 33:* 172-177. 1953.—An expt. is described in which sexually immature pullets were treated with either (a) no hormones, (b) androgen, (c) estrogen or (d) estrogen plus androgen, given concurrently. Ca balances were struck over an exptl. period of 10 days. Estrogen plus androgen increased avg. daily Ca retention to a level significantly higher than did the other treatments, confirming previous work. Estrogen or androgen increased avg. daily Ca retention slightly but significantly. There was a significant interaction of estrogen and androgen in regard to the large increase of retention evoked by estrogen plus androgen.—*Authors.* (Biological Abstracts)

FRAPS, R. M., and J. F. CASE. (U.S. Dept. Agric. Beltsville, Md.)
PREMATURE OVULATION IN THE DOMESTIC FOWL FOLLOWING ADMINISTRATION OF CERTAIN BARBITURATES. *Proc. Soc. Exptl. Biol. and Med. 82:* 167-171. 1953.—Ovulatory reactions of the first follicle of the hen's ovulation sequence to barbiturates, and to barbiturates with progesterone, are described. Ovulation occurred prematurely in a significant proportion of hens following admn. of some barbiturates (Dial, Ipral and Nembutal), rarely with barbital, and not at all with phenobarbital. Near subovulatory dosages of progesterone acted synergistically with Dial and Nembutal which themselves cause premature ovulation an effect not found when progesterone was similarly admd. with phenobarbital. Prematurity of ovulation following the admn. of effective barbiturates probably results from neural excitation secondary to depression, excitation causing, over a humoral pathway, release of ovulation-inducing gonadotropin from the anterior pituitary body.—*Auth. summ.* (Bilogical Abstracts)

GODFREY, GEORGE F., C. WILLIAMS, and C. E. MARSHALL. (Oklahoma Agric. Expt. Sta., Stillwater.)
THE RELATIVE INFLUENCE OF EGG SIZE, AGE AT SEXUAL MATURITY AND MATURE BODY WEIGHT ON GROWTH TO TWELVE WEEKS OF AGE. *Poultry Sci 32:* 496-500. 1953.—Regression methods were used to determine the relative influence of size of egg from which the chick hatches, of age at sexual maturity, and of mature body wt. on bi-weekly body wts. from hatching to 12 wks. of age in 254 females of the Okla. Strain of New Hampshires. Influence of size of egg from which the chick hatches decreases rapidly after 2 wks. of age and has no appreciable effect on wt. at broiler age. Age at sexual maturity begins to affect body wt. at 4-6 wks. of age. Mature body wt. exerts an influence on growth as early as 4 wks. of age. The effect of mature body size increases faster than the effect of rate of sexual maturity, and at 12 wks. exerts about 2-3 times the influence of age at sexual maturity. The 3 variables account for about 36% of the variation observed in body wt. at 10 and 12 wks. of age. At 2, 4, 6, and 8 wks. of age, the 3 variables account for about 14, 15, 21, and 24% of the phenotypic variation. At hatching due to the relatively large influence of egg size, these 3 factors account for about 74% of the observed variation.—*G. F. Godfrey.* (Biological Abstracts)

KELLY, ELIZABETH K., and HERMAN BRANSON. (Howard U., Washington, D.C.)
A STUDY OF BIOLOGICAL VARIABILITY: THE DISTRIBUTION OF P^{32} IN THE PHOSPHORUS COMPOUNDS OF THE 8-DAY CHICK EMBRYO. *Poultry Sci. 31:* 466-473. 1952.—In expts. on

P metabolism studied with P^{32} in the 8-day chick embryo, analyzed in groups of 3, the specific activities of the phosphatide, acid-soluble, inorganic plus adenosine, inorganic plus phosphocreatine, residual and inorganic P fractions varied from a low of ± 11% of the mean for the acid solubles to a max. of +28% and —29% of the mean for the inorganic fractions. In expts. on the effects of chemical or physical agents, by working with fairly large samples (e.g. 12 values) for each fraction the sensitivity of the expt. in revealing differences between the exptl. and control values may be greatly increased. From the data it was concluded that, if the means of the inorganic P fractions differ by only 35% (the smaller taken as 100%), the probability is 99% that the difference is attributable to the agent. The specific activities of the P fractions fall into 3 groups with the inorganic P from phosphocreatine, phosphatide, and inorganic P plus adenosine P having essentially the same value (0.09), the residual P and acid soluble P form the 2d group (0.065) and the inorganic P is lowest (0.027). These findings are consistent with the view that the embryo uses the inorganic P in the yolk to build its organic P compounds. This inorganic P is produced by the hydrolysis of organic compounds in the yolk.—*Auth summ.* (Biological Abstracts

KUDZIA, J. J., and L. R. CHAMPION. (Michigan State Coll., East Lansing.)
INVESTIGATIONS CONCERNING THE EFFECTS OF CORTISONE IN THE DOMESTIC FOWL. *Poultry Sci. 32:* 476-481. 1953.—Cortisone acetate was administered subcut. at 3 dosage levels to yearling New Hampshire chickens. Data are presented on effects observed for body wt., egg production, egg size, feather development, fertility, hatchability, day-old and 2 weeks chick weight.—*L. R. Champion.* (Biological Abstracts)

MacIVER, R. M. (Poultry Res. Centre, Edinburgh.)
FACTORS AFFECTING THE ONSET AND DURATION OF ANNUAL REST IN THE DOMESTIC FOWL. *Proc. Roy. Soc. Edinburg 65B:* 73-83. 1953.—A study involving the effects of supplementary artificial lighting during the winter upon a line of Brown Leghorn hens, reveals that the onset of the annual rest is delayed as a result of its use, and the tendency for onset of rest to become earlier in successive laying cycles is reduced. The influence of time of onset in determining the duration of rest is higher in birds that commence their rest early than in those commencing later, resulting in a curvilinear relationship between these two parameters. A hypothesis accounting for this phenomenon is proposed. The relative importanec of age at onset of first annual rest in determining its duration appears to be negligible. This conclusion is based on an analysis of records pertaining to a generation of the same line which was hatched over an abnormally long hatching season, thus enabling the effects of "date" and "age" to be separated.—*Author.* (Biological Abstracts)

MORI, NOBUMI, KIYOSHKI NAKANO, KENICHI YAMADA, and HAJIME GESHI. [In Japanese with English summ.]
STUDIES ON THE SEXUAL MATURITY OF POULTRY. EFFECTS OF THE PHOTOPERIODS ON THE SEXUAL MATURITY OF THE FEMALE POULTRY. *Sci. Repts. Shega Agric. Coll. 3:* 36-48. 1953.—Under natural illumination, ovaries and oviducts of ducks hatched about the middle of April developed rapidly both in size and in wt. during 14-17 weeks after hatching. Variation of photoperiods or the method of giving light in 14-17 weeks after hatching gave remarkable effects on the development of the anterior lobe of the pituitary gland, the ovary, and the oviduct. Variation of photoperiods after 18 weeks after hatching resulted in no effective difference in sexual maturity, while variation in photoperiods during 14-17 weeks after hatching caused an effective difference in sexual maturity. The minimum day length necessary to stimulate the sexual maturity of female poultry may be presumed to be about 11 hrs. Increasing the light gradually is more effective than supplying a constant amt., and the method of supplying the light is more important than the total hours of illumination. The photo-

period does not seem to be the primary factor concerning body wt. of the ducks at the first laying.—*From auth. summ.* (Biological Abstracts)

OLOUFA, MOHAMED M. (Coll. Agric., Cairo U., Egypt.)
EFFECT OF THYROPROTEIN ON EGG PRODUCTION, EGG WEIGHT AND BODY WEIGHT OF CHICKENS DURING SUMMER. *Poultry Sci. 32:* 391-394. 1953.—Addition of thyroprotein, at the rate of 10 g. per 100 lbs. of ration, to the ration of Egyptian hens in their 1st, 2d or 3d laying season, for a 9-week period had no effect on body wt. or mortality, improved egg-shell thickness, but decreased both egg production and egg weight.—*H. Branion.* (Biological Abstracts)

RIGOR, TOMAS V., and MACARIO LIGSAY. (Bureau of Animal Industry, Manila, Philippines.)
A STUDY OF INCUBATION RECORDS AT ALABANG STOCK FARM. *Philippine Jour. Anim. Indus. 12 (1-4) 39-44.* 1951.—Around the calendar incubation records of White Leghorn, New Hampshire, Rhode Island Red, and Barred Plymouth Rock at Alabang Stock Farm were studied and it was observed that the New Hampshires gave the highest monthly percentages of fertility and hatchability; the White Leghorns, second; the Rhode Island Reds, third; and the Barred Plymouth Rocks, the lowest. Both the last two breeds exhibited greater variability in the mean monthly fertility and hatchability than the other two breeds observed.—*F. M. Fronda.*

VAITSMAN, JORGE, and JEFFERSON ANDRADE dos SANTOS.
HORMONIOS NO NUMENTO DA PRODUCAO ANIMAL. EXPERIENCIAS COM O "STILBESTROL." [THE HORMONE STILBESTROL IN ANIMAL PRODUCTION.] *Rev. Militar Remonta e Vet. 11:* 117-128. 1951.—Various hormones are administered to animals for increasing their production, such as milk, eggs and fat. Pellets containing stilbestrol are implanted subcut. in young cockerels as a non-surgical method of caponizing; also in hens to increase egg production. In a limited number of expts. the authors fed meat of such capons to rats and produced estrus in castrated females and disorders of the seminal vesicles in males. They demonstrated that the hormone persists for some time in the meat of such poultry and that there is the possibility of danger to humans consuming excessive amts. of such meat.—*H. A. Smith.* (Biological Abstracts)

WEITZEL, G., A. M. FRETZDORFF, and J. WOJAHN. (Max Planck-Gesellschaft, Göttingen, Germany.)
UNTERSUCHUNGEN UBER DIE BURZELDRUSE DER VOGEL III. STRUKTURAUFKLARUNG DER OPTISCH AKTIVEN HEPTANSAURE AUS BURZELDRUSEN VON ENTEN. MIT RAMANSPEKTROSKOPISCHEN MESSUNGEN BY J. GOUBEAU. [INVESTIGATIONS ON THE COCCYGEAL GLANDS OF FOWLS III. ANALYSIS OF THE STRUCTURE OF OPTICAL ACTIVE HEPTANOIC ACID FROM DUCK COCCYGEAL GLANDS. (WITH RAMAN SPECTROSCOPIC MEASUREMENTS.)] *Heppe-Seyler's Zeitschr. Physiol. Chem. 29:* 29-45. 1952.—Synthetic 2-methyl-, 3-methyl-, 4-methyl- and 5-methyl-hexanoic acids and 2-ethylpentanoic acid, their ethyl esters and corresponding alcohols, acid amines and 2-alkylbenzimidazoles were compared with the unknown heptanoic acid and its derivatives. Identity of boiling and melting points led to the suggestion of a 4-methyl-hexanoic acid, which was confirmed by Raman spectroscopy. The fatty acids from coccygen glands of ducks consist of 4-methyl- and 2-methylhexanoic acids in a proportion of about 4:1.—*K. H. Kimbel.* (Biological Abstracts)

WEITZEL, G., A. M. FRETZDORFF, and J. WOJAHN. (Max-Planck-Gesellschaft, Göttingen, Germany.)
UNTERSUCHUNGEN UBER DIE BURZEL-DRUSEN DER VOGEL, IV. MITTEILUNG DIE FETTSTOFFE DER BURZELDRUSEN VON GANSEN. [INVESTIGATIONS ON THE COCCYGEAL GLANDS OF FOWLS. IV. THE FAT SUBSTANCES FROM GOOSE COCCYGEAL GLANDS.] *Hoppe-Seyler's Zeitschr. Physiol. Chem. 29:*

46-57. 1952.—Ether-soluble fats from goose coccygeal glands consist mostly of octadecyl esters of optically active fatty acids; the unsaponificable fraction contains, therefore, nearly nothing but n-octadecanol. Fatty acids are composed of 80% C_{14} liquid, saturated acids, the minor parts are normal C_{16} and C_{18} acids, chiefly stearic and oleic acids.—*K. H. Kimbel.* (Biological Abstracts)

WINCHESTER, C. F., and V. C. SCARBOROUGH. (U.S. Dept. of Agric., Beltsville, Md.)

THE INFLUENCE OF THYROXIN ON GROWTH AND EGG PRODUCTION OF CHICKENS. *Poultry Sci. 32:* 423-429. 1953.—Female New Hampshire chicks, in which thyroid glands were destroyed by injected I^{131} at one day of age, grew slowly and weighed half as much as controls at 6 weeks. Daily injuns. at levels from 1/16 to 256 μg. per 100 g. unit body wt. to ¾ power (3 to 12,800% of normal glandular secretion), begun at age—6 weeks, led to rapid response (growth) except at the highest and the lowest dosage-levels. Egg production of groups given 4 through 32 μg. of thyroxin per unit of body size (200 through 1600% of normal glandular output of growing birds) was about normal, while, with a single exception, at levels of 1/4 μg. or less or 128 μg. or more pullets did not lay. Laying nearly ceased when therapy was interrupted, was resumed with resumption of therapy, and, at most favorable therapy-levels, returned to normal. Such interrupted therapy did not influence body wt.—*C. F. Winchester.* (Biological Abstracts)

NUTRITION

ALMQUIST, H. J. (Grange Co., Modesto, Calif.)

DEHYDRATED ALFALFA MEAL IN POULTRY RATIONS. *Feedstuffs 25(20):* 34, 57, 58. 1953.—Alfalfa is a fairly well balanced source of protein for poultry but a little low in methionine. Other crude fractions (fat, fiber and carbohydrates) are not highly available to poultry. 17% crude fiber alfalfa has about 44% of total indigestible material, and a 27% fiber meal has about 59% total indigestible material. This bulk may be responsible for lack of growth in chicks fed large amts. of alfalfa. Alfalfa meal is a good source of carotene, and also other growth factors.—*H. L. Wilcke.* (Biological Abstracts)

ALMQUIST, H. J. (Grange Company, Modesto, Calif.)

HIGH ENERGY FEEDS. *Feedstuffs 25(8):* 28-30. 1953.—Calories in feeds are provided primarily by digestible protein and carbohydrate, but protein cannot supply calories if it is utilized for building new tissues and proteins. There is no standard for high energy feeds, so the definition of that term varies. Both fiber and the indigestible fractions of protein and carbohydrate make up the "useless" bulk in a feed. Beltsville White turkeys fed pelleted mashes varying in fiber level and wheat as the grain showed that wt. gains were independent of fiber levels, the ratio of feed to gain was practically independent of mash fiber level when that level was over 6%, grain consumption was higher at the higher fiber levels, and feed cost per pound of gain was less at the higher fiber levels.—*H. L. Wilcke.* (Biological Abstracts)

ALMQUIST, H. J., and STANLEY MAURER. (The Grange Co., Modesto, Calif.)

A METHOD FOR STUDY OF THE EFFECTS OF HEAT ON THE NUTRITIVE VALUE OF SOYBEAN OIL MEAL. *Poultry Sci. 32:* 549-550. 1953.—The formaldehyde titration procedure was employed to estimate the relative loss of basic groups on progressive heating of soybean meal. Such loss would include the epsilon amino group of lysine which is known to be destroyed on overheating. Titer values showed the most rapid drop in the first 5 min. of heating and thereafter a steady decline. The decline after 5 min. was closely related to the reduction in feeding value of the meal for rats.—*H. J. Almquist.* (Biological Abstracts)

ALMQUIST, H. J., and J. B. MERRITT. (The Grange Co., Modesto, Calif.)

EFFECT OF FIBER LEVEL IN MASH ON GAIN AND ECONOMY OF BELTSVILLE SMALL WHITE TURKEYS. *Poultry Sci. 32:* 548-549. 1953.—Beltsville Small White toms, 10 weeks of age, were fed

mashes varied in fiber content by changing the proportions of milo and barley. Hens were fed the same mashes at 12 weeks of age. Mashes and wheat grain were available, ad lib. The tests were terminated at 18 weeks. Weight gains were independent of mash fiber levels. The proportion of whole grain selected was directly related to mash fiber. Ratio of feed to gain was independent of mash fiber in toms, and in hens at fiber levels below 6%. Feed cost per lb. of gain increased as mash fiber level decreased.—*H. J. Almquist.* (Biological Abstracts)

BALLOUN, STANLEY L., ELTON L. JOHNSON, and L. K. ARNOLD. (Iowa State Coll., Ames.)

LABORATORY ESTIMATION OF THE NUTRITIVE VALUE OF SOYBEAN OIL MEALS. *Poultry Sci 32:* 517-527. 1953.—The correlation of several laboratory tests with the nutritive value of soybean oil meal for chicks has been studied. Urease activity was a satisfactory measure of heat treatment of meals up to the point of opt. heating, was of no value in determining overheating. The titration of ammonia released from added urea by the enzyme was a more precise measure of the adequacy of heat treatment than was masurement of pH change. It is concluded that both water-soluble N and urease detns. are satisfactory measures of underheating. A detn. of fluorescence is an adequate measure of overheating in solvent-extracted meals, but is of little value in detecting overheated expeller meals. Expeller meals were high in fluorescing properties regardless of whether overheating had occurred. The improved nutritive value of autoclaved meal was not entirely due to increased availability of the protein since chick growth was retarded when 10 or 15% of unheated meal was added to a diet adequate in high-quality meal.—*Elton Johnson.* (Biological Abstracts)

BANDONG, FRANCISCO C. (University of the Philippines, College of Agriculture, College, Laguna, Philippines.)

A COMPARISON OF TWO RATIONS FOR GROWING CHICKS. *Philippine Agric. 36:* 90-101. 1952.—At the age of twelve weeks, the chicks fed with the College all-mash chick ration were heavier than those fed Vitamelk; they consumed less feed to make a kilogram gain in weight; and they gave higher returns above the cost of feed. The mortality, however, was higher in the College all-mash fed chicks than those fed Vitamelk.—*F. M. Fronda.*

BATTIG, M. J., E. G. HILL, T. H. CANFIELD, and H. J. SLOAN. (U. Minnesota, St. Paul.)

PREVENTION OF PEROSIS IN GOSLINGS BY NICOTINIC ACID. *Poultry Sci. 32:* 550-551. 1953.—40 mg. of synthetic nicotinic acid per kg. of ration completely prevented perosis, but brewers' yeast at the same calculated level of nicotinic acid did not bring about a major improvement in the perotic condition.—*M. J. Battig.* (Biological Abstracts)

BURGESS, R. C., M. GLUCK, and D. H. LAUGHLAND. (Dept. Agric., Sci. Serv., Ottawa, Canada.)

BIOCHEMICAL CHANGES IN THE PENICILLIN-FED CHICK. *Poultry Sci. 32:* 444-449. 1953.—The concn. of liver protein, ether-extractable material and cholesterol was unaffected by the dietary administration of penicillin to chicks for 30 days. The packed-cell volume and hemoglobin percentage were not changed nor were the plasma levels of non-protein N, creatinine, glucose, total fatty acid or cholesterol. There was an increase in liver vitamin A concn. and in the ascorbic acid and carotenoid pigment levels of plasma when growth was enhanced by penicillin. Penicillin produced a rise in plasma phospholipid P concn. both in the presence and absence of a growth response attributable to the antibiotic.—*Auth. summ.* (Biological Abstracts)

DAVIS, R. L., G. M. BRIGGS, and H. J. SLOAN. (U. Minnesota, Minneapolis.)

EFFECT OF COBALT IN DIET OF THE CHICK. *Proc. Soc. Exptl. Biol. and Med. 82:* 175-177. 1953.—Addition of 10 to 100 mg. of cobalt sulfate per kg. of a vitamin B_{12}-deficient, corn-soybean oil meal diet caused stimulation of chick growth. No observable effects were ob-

tained when cobalt sulfate was added to the same diet supplemented with ample vitamin B_{12}. This is further evidence that under certain conditions Co may improve the nutrition of vitamin B_{12}-deficient, non-ruminating animals, perhaps due to the synthesis of vitamin B_{12} in the intestinal tract or in the feces.—*G. M. Briggs.* (Biological Abstracts)

EDWARDS, H. M., RICHARD DAM, L. C. NORRIS, and G. F. HEUSER. (Cornell U., Ithaca, N. Y.)
PROBABLE IDENTITY OF UNIDENTIFIED CHICK GROWTH FACTORS IN FISH SOLUBLES AND PENICILLIN MYCELIUM RESIDUE. *Poultry Sci. 32:* 551-554. 1953.—These expts. provide further evidence of the existence of 1 or more unknown chick growth factors in fish solubles. Studies were made of the relative value of fish solubles and penicillin mycelium residue as sources of unidentified chick growth factors. The results of 2 expts. show that these materials are qualitatively of approx. comparable value. A purified diet with glucose as the source of carbohydrate and washed alpha-protein as the source of protein was fed. Iodinated casein was used as a stress factor to increase growth differences between chicks fed the basal and those fed the supplemented diets. Addition of penicillin mycelium residue to the diets increased the lysine, threonine and tryptophan content insignificantly, and all B-group vitamins were supplied in excess to eliminate the possibility of the growth response being caused by increased supply of these vitamins. Both fish solubles and penicillin mycelium residue promoted a marked increase in gain during the 4 weeks exptl. period. Responses obtained with penicillin mycelium residue were shown not to be due to their penicillin content.—*I. R. Yigdall.* (Biological Abstracts)

ELAM, J. F., R. L. JACOBS, W. L. TIDWELL, L. L. GEE, and J. R. COUCH. (Texas A. and M. Coll. System, College Station.)
POSSIBLE MECHANISM INVOLVED IN THE GROWTH-PROMOTING RESPONSES OBTAINED FROM ANTIBIOTICS. *Jour. Nutrition 49:* 307-317. 1953.—In 2 separate expts. New Hampshire chicks were maintained in batteries with raised screen floors. Feed and water were supplied ad libitum and the chicks were weighed at weekly intervals during an exptl. period of 10 wks. Data presented in this report show that a close relationship exists between the admn. of an antibiotic, a decrease in the total number of clostridia per g. of feces, and an increase in chick growth. Earlier reports are confirmed to the effect that penicillin, aureomycin, bacitracin and terramycin stimulated the growth of chicks. Arsanilic acid and Na arsanilate were shown to increase growth and decrease the total number of clostridia per g. of feces when fed to chicks.—*Auth.* (courtesy of Wistar Bibl. Serv.). (Biological Abstracts)

FUZITA, ZINKICHI, MASANORI KATSUNO, and KENZI MAKINO.
EFFECTS OF A TERRAMYCIN ON THE GROWTH AND THE INTESTINAL BACTERIA OF CHICKS FED AN ALL-PLANT PROTEIN RATION. *Tohoku Jour. Agric. Res. 3:* 83-92. 1952.—Chicks on a basic diet of corn, rice, soybean cake, and bran, grew on the avg. less rapidly if the diet was supplemented by either vitamin B_{12} or terramycin, but grew better when given both. Vitamin B_{12} alone seems not to be helpful because certain bacteria synthesize it in sufficient quantity, and terramycin alone is injurious because it destroys the synthesizing bacteria. Differences in body wt. are established during the first 5 weeks of growth, and do not later increase materially. The bacteria of the feces are mostly of the coli group; terramycin decreases their number during the early weeks, but not later, when terramycin-resistant strains are abundant.—*H. F. Copeland.* (Biological Abstracts)

GODFREY, P. R., C. W. CARRICK, and F. W. QUACKENBUSH. (Purdue U., Lafayette, Ind.)
IODINE NUTRITION OF CHICKS. *Poultry Sci. 32:* 394-396. 1953.—Chicks grew as well during 6 weeks on a ration containing 360 parts per billion of iodine and during 11 weeks on a ration containing 30 p.p.b. of I as they did on the same basal rations when I was added. No thyroid deficiency symptoms were observed after 6 weeks on a highly purified

ration containing 360 p.p.b. of I; enlarged thyroids were observed only on the basal ration containing 30 p.p.b. of I. The I requirement of chicks on a corn-soybean meal ration containing 30 p.p.b. of I was observed to be between 30 and 150 p.p.b.—*Auth. summ.* (Biological Abstracts)

GRAU, C. R., and PHYLLIS A. ZWEIGART. (U. California, Berkeley.) PHOSPHATIC CLAY AS A PHOSPHORUS SOURCE FOR CHICKS. *Poultry Sci. 32:* 500-503. 1953.—When fed to chicks in a diet composed of natural feedstuffs, phosphatic clay (soft phosphate with colloidal clay) improved calcification over the basal diet somewhat, but was not as good a source of P as bonemeal or $Ca_3(PO_4)_2$. Bonemeal improved growth but phosphatic clay did not. The F content of phosphatic clay did not appear to account for the effect upon growth.—*P. A. Sweigart.* (Biological Abstracts)

HANSEN, R. G., H. M. SCOTT, B. L. LARSON, T. S. NELSON, and P. KRICHEVSKY. (Illinois Agric. Expt. Sta., Urbana.) GROWTH STIMULATION AND GROWTH INHIBITION OF CHICKS FED FORAGE AND FORAGE JUICE CONCENTRATE. *Jour. Nutrition 49:* 453-464. 1953.—Chick growth was stimulated when either dehydrated or sun-cured alfalfa was added to a purified diet containing all known factors. Dehydrated meal at 10-20% gave a response comparable to that elicited by 5% of a forage juice concentrate. The growth factor appears to be more concentrated in sun-cured meal than in dehydrated meal, since the former gave its max. response at the 5% level. This would suggest that the high temp. required to process dehydrated meal was responsible for the decrease in activity. The existence of the growth factor in alfalfa meal is difficult to demonstrate in chicks when the meal is added to a practical diet. When added to a purified diet, alfalfa meal does not depress chick growth until the level of intake exceeds 20%. Even at a 40% level alfalfa meal does not materially depress growth below that of chicks receiving no alfalfa. Growth inhibition can be more readily demonstrated with the practical diet than with the purified diet, which suggests that other natural feed ingredients may also contain substantial amts. of the growth inhibitor.—*Auth.* (courtesy of Wistar Bibl. Serv.).

HILL, D. C., H. D. BRANION, S. J. SLINGER, and G. W. ANDERSON. (Ontario Agric. Coll., Guelph, Ontario, Canada.) INFLENCE OF ENVIRONMENT ON THE GROWTH RESPONSE OF CHICKS TO PENICILLIN. *Poultry Sci. 32:* 462-466. 1953. —Diets with and without added penicillin were fed to comparable groups of chicks in 2 animal houses, one which had housed chicks for many yrs. and the other which was a new structure previously unused. Growth response to penicillin was earlier and much greater in the old quarters than the new. Bacteriological examination of the cecal microflora of representative birds revealed striking differences between the 2 animal houses in the relative numbers of various types of organisms, and in the manner these numbers responded to penicillin. The growth results are in agreement with the observations of Coates et al. (Nature 168: 332. 1951; Jour. Sci. Food Agric. 3: 43-48. 1952), and support their theory that at least part of the growth stimulation obtained by feeding antibiotics to chicks can be attributed to the suppression of an infection by the antibiotics.—*D. C. Hill.* (Biological Abstracts)

HUGHES, G. PEARSON, and DUDLEY E. EYLES. (Grassland Res. Sta., Stratford-on-Avon, Eng.) EXTRACTED HERBAGE LEAF PROTEIN FOR POULTRY FEEDING. I. INTRODUCTION AND FEEDING TRIAL WITH LAYING HENS. *Jour. Agric. Sci. 43:* 136-143. 1953.—The extraction of leaf protein from perennial rye-grass is described. In a 10-wk. feeding trial, no difference occurred in the number of eggs or the total wt. of eggs laid by the birds fed on leaf protein plus minerals as compared with controls fed on fish meal. Yolk height was greater in eggs from birds fed on the ration containing fish meal. This ration also resulted in a larger number of eggs with rough shells and containing a higher content of foreign bodies. The eggs from both treatments had low "yolk-colour indices," showing that leaf xanthophylls were not present in

quantities in the leaf-protein extract. The eggs laid by birds fed on leaf protein had greenish albumen, indicating that if laying birds are to be fed on leaf proteins, the chlorophyll should be removed. No ill effects were observed in the birds fed on the leaf-protein.—*R. E. Burns.* (Biological Abstracts)

HUGHES, G. PEARSON, and DUDLEY E. EYLES. (Grassland Res. Sta., Stratford-on-Avon, Eng.)
EXTRACTED HERBAGE LEAF PROTEIN FOR POULTRY FEEDING. II. THE USE OF LEAF PROTEIN IN CHICK RATIONS. *Jour. Agric. Sci. 43:* 144-151. 1953.—Two live weight gain expts. using day-old chicks are described. A mash containing a basic ration with leaf protein was compared with a control mash containing the basic ration plus fish meal. Sources, chemical analysis of leaf protein and mash are given. The leaf protein chicks had deep yellow pigmentation. In one trial the fish meal was superior; in another trial they were of equal value. A new method of measuring the biological value of the protein of herbage plants is suggested, using extracted protein fed to chicks and rats. It is concluded that a mash composed of home-grown cereals plus leaf protein with vitamins, minerals, and amino acids added would be suitable for raising chicks.—*R. E. Burns.* (Biological Abstracts)

KELLY, J. W., ROY DEARSTYNE, and H. L. LUCAS. (N. Carolina State Coll., Durham.)
FEED 'EM DIRT. *Feedstuffs 25:* 54. 1953.—The addition of 7% topsoil, air dried at room tempt. to a practical turkey ration reduced the degree of swollen hocks. The control lot showed 85% swollen hocks and the soil group only 29%. The total intake of soil was less than 3.5% of the diet. Addition of vitamin B_{12} supplements or terramycin were ineffective. Possible explanations are presented.—*H. L. Wilcke.* (Biological Abstracts)

KENNEDY, GEORGE H., JAMES P. MARVEL, J. WADDELL, HARRY W. TITUS, and ARNON L. MEHRING, JR.
ASSAY OF VITAMIN D USING A STRAIN OF CHICKENS SELECTED FOR THEIR UNIFORMITY OF RESPONSE. *Poultry Sci. 32:* 29-38. 1953.—Relative precision was obtained of 2 concurrent assays of vit. D where the criterion of response was the degree of skeletal calcification estimated as the ash of the tibia. In one assay 120 New Hampshire chicks, 50 males and 70 females, were used from matings that had previously produced progeny which when fed a fixed quantity of vit. D had responded within a narrow range—32.25-34.25% tibia ash. A similar number of White Leghorn chicks, but 116 males and 2 females whose uniformity of response was not controlled by selected matings was used for comparison. The ash of the tibia of each chick was detd. and the precision as the ratio, λ, of the standard deviation of response to the slope of the (log.) dose response curves for each assay was computed on the basis of the observed variation both within and between dosage groups. λ within dosage groups for the assay using chicks from selected matings was 0.147 ± 0.017; and significantly less precision ($P = 0.025$) was obtained in the comparison assay where λ was 0.324 ± 0.076. When the precision was based upon the variation in response between dosage groups per chick, the assay with the chicks from selected matings indicated a λ of 0.014 and that for the assay with chicks from random matings 0.037, showing a lower precision for the latter assay. Some comparable published values for the vit. D assay with chicks are 0.060, and 0.120.—*G. H. Kennedy.* (Biological Abstracts)

LEE, CLARENCE E., OLIN A. ROWOTH, C. L. HENRY, and JOSEPH PRESTO. (Beacon Milling Co., Cayuga, N.Y.)
THE EFFECT OF SUPPLEMENTARY ALL-MASH PELLETS IN THE ALL-MASH FEEDING PROGRAM FOR LAYERS USING AUTOMATIC FEEDERS. *Poultry Sci. 32:* 429-433. 1953.—1200 S.C.W. Leghorns randomly divided into 2 groups were compared for a total of 630 days in 2 laying years to determine the effect of supplementary pellets. Birds receiving pellets showed better feed conversion, significantly higher egg production and slightly lower feed cost per dozen

eggs. Body wt. and mortality showed no significant difference between the groups.—*C. E. Lee.* (Biological Abstracts)

LILLIE, ROBERT J., and H. R. BIRD. (U.S. Dept. Agric., Beltsville, Md.) EVALUATION OF ANTIBIOTIC FEED SUPPLEMENTS AND CRYSTALLINE ANTIBIOTICS IN CHICK RATIONS. *Poultry Sci. 32:* 531-535. 1953.—Studies were undertaken to evaluate the antibiotic activity of commercial antibiotic feed supplements with a chick assay. Of 16 so-called APF supplements obtained prior to Jan. 1, 1951, only 3 produced the growth stimulus characteristic of antibiotic activity. Every one of the 9 antibiotic feed supplements obtained after Jan. 1, 1951, exhibited antibiotic activity as judged by its growth stimulating effect. Evaluation of crystalline antibiotics found chloramphenicol ineffective; however, chloramphenicol mycelial meal produced a slight growth stimulation. Tomatidine exerted no growth promoting effect. Fumagillin proved toxic at the levels used. Tyrothricin, gramacidin and neomycin showed evidence of growth stimulating effects but their effects were less consistent and of lesser magnitude than those produced by the antibiotics now being used commercially in feeds.—*H. R. Bird.* (Biological Abstracts)

LILLIE, ROBERT J., J. R. SIZEMORE, and H. R. BIRD. (U.S. Dept. Agric., Beltsville, Md.) ENVIRONMENT AND STIMULATION OF GROWTH OF CHICKS BY ANTIBIOTICS. *Poultry Sci. 32:* 466-475. 1953.—The rate of growth of R.L. Red and New Hampshire chicks fed no antibiotic in new quarters was greater than that of chicks given 10 mg. of aureomycin per kg. of diet in old quarters. The growth stimulating effect of antibiotic was evident at 1 week of age in old quarters and increased in magnitude until at least 4 weeks of age. The response to the antibiotic was considerably less in new quarters and was first evident at 4 weeks of age in one expt. and at 2 or 3 weeks in the other. When chicks were moved from new to old quarters at 4 weeks of age and deprived of antibiotic there was a temporary slump in growth rate. There was no such slump when antibiotic was withdrawn from the diet of chicks that had been kept continuously in old quarters. Chicks kept in new environment without antibiotic used their feed at least as efficiently as chicks given antibiotic in an old environment. Both were more efficient than chicks kept in an old environment without antibiotic. These results support the explanation of growth stimulating effect of antibiotic based on a hitherto unsuspected infectious condition. The results of the expts. on antibiotic withdrawal also suggest that the antibiotic exerts its effect by giving partial protection to the chick during the post-hatching period while it is becoming adjusted to its microbiological environment.—*H. R. Bird.* (Biological Abstracts)

MORRISON, A. B., D. R. CLANDININ, and A. R. ROBBLEE. (U. Alberta, Edmonton, Canada.) THE EFFECTS OF PROCESSING VARIABLES ON THE NUTRITIVE VALUE OF SUNFLOWER SEED OIL MEAL. *Poultry Sci. 32:* 492-496. 1953.—Processing conditions employed in production of sunflower seed oil meal affected the nutritive value of the meal. The nutritive value of the meal increased as the processing temps. were lowered. Opening the choke on the expeller resulted in the production of sunflower seed oil meals of superior nutritive value to that of meals processed under similar temp. conditions with the choke in the regular position. Sunflower seed oil meal of equivalent nutritive value to solvent-extracted soybean oil meal was produced by lowering the processing temps. from 240°F. in the cooker to 200°, 260° in the conditioner to 220°, and opening the choke on the expeller.—*D. R. Clandinin.* (Biological Abstracts)

MORRISON, A. B., D. R. CLANDININ, and A. R. ROBBLEE. (U. Alberta, Canada.) THE SUPPLEMENTARY VALUE OF SUNFLOWER SEED OIL MEAL IN PRACTICAL CHICK STARTING RATIONS. *Poultry Sci. 32:* 542-547. 1953.—Low-temp. sunflower seed oil meal (processed in the

cooker for 30 min. at 200°F. and in the conditioner for 3 min. at 220°F.) was of greater nutritive value than regular-temp. sunflower seed oil meal (processed for similar times in the cooker at 240° and in the conditioner at 260°). Low-temp. sunflower seed oil meal satisfactorily replaced 2/3 of the fish meal and meat meal mixture, all of the meat meal, or 2/3 of the soybean oil meal in the practical chick starters used. Regular-temp. sunflower seed oil meal satisfactorily replaced 1/3 of the fish meal and meat meal mixture, or 2/3 of the soybean oil meal in the starters used. When 2.5% fish meal was included in the starter, regular-temp. sunflower seed oil meal satisfactorily replaced 1/3 of the meat meal in the ration. When meat meal was the only protein supplement in the starter, regular-temp. sunflower seed oil meal replaced all of the meat meal in the ration.—*D. R. Clandinin.* (Biological Abstracts)

PATRICK, HOMER. (U. Tennessee, Knoxville.)
COMPARATIVE GROWTH PROMOTING VALUE OF PROCAINE AND DIAMINE PENICILLIN FOR CHICKS. *Poultry Sci. 32:* 554-555. 1953.—The response obtained by feeding supplements of methionine or homocystine was greater than that obtained from the antibiotics. The comparative nutritional value of diamine or procaine penicillin when fed alone or in combination with methionine or homocystine appears to be similar. A combination of either one of these forms of penicillin with methionine or homocystine gave a better response than when either were used alone.—*H. Patrick.* (Biological Abstracts)

PETERSEN, C. F., A. C. WIESE, G. E. MILNE, and C. E. LAMPMAN. (U. Idaho, Moscow.)
VITAMIN B_{12} REQUIREMENTS FOR HATCHABILITY AND PRODUCTION OF HIGH QUALITY CHICKS. *Poultry Sci. 32:* 535-542. 1953.—Expts. were conducted to determine the minimum vitamin B_{12} requirements for hatchability and a maximum transfer of the vitamin from the hen, through the egg, to the newly-hatched chick. The hens were reared on either built-up litter, raised wire floors or laying batteries and fed rations supplemented with various levels of vitamin B_{12}. The vitamin B_{12} carry-over in chicks obtained from these hens was measured by chick growth to 4 weeks of age. The results show, for hens maintained in laying cages or on raised wire floors, the minimum vitamin B_{12} requirement for hatchability to be 1.5 to 2 μg. per lb. of feed. When raised on built-up litter the requirement for hatchability was no greater than 0.75 μg. per lb. of feed. Breeder hens require from 3 to 4 μg. of vitamin B_{12} per lb. of feed to assure a maximum transfer of the vitamin to day-old chicks.—*A. C. Wiese.* (Biological Abstracts)

SANTOS, JR., SEVERINO R. (University of the Philippines, College of Agriculture, College, Laguna, Philippines.)
THE INFLUENCE OF ANIMAL PROTEIN FACTOR AS A SUPPLEMENT TO GROWING CHICK RATIONS CONTAINING VARYING AMOUNTS OF FISH AND MUNGO MEALS. *Philippine Agric. 36.* 83-89. 1952.—The results of the study showed that as much as 25 per cent of the fish meal could be satisfactorily substituted with mungo meal when 1 per cent APF was supplemented to the rations. Even when APF was added, the substitution of a greater amount of fish meal with mungo meal yielded poor results.—*F. M. Fronda.*

SCOTT, H. M., H. FISHER, and J. M. SNYDER. (U. Illinois, Urbana.)
ALFALFA MEAL AS A SOURCE OF UNIDENTIFIED GROWTH FACTORS. *Poultry Sci. 32:* 555-556. 1953.—Each of three samples of dehydrated and sun-cured alfalfa meal significantly improved chick growth when added at the 5% level to a purified diet containing all nutrients known to be required by this species. The growth promoting ability of the sun-cured meals was significantly superior to that of the dehydrated meals.—*H. M. Scott.* (Biological Abstracts)

SCOTT, M. L. (Cornell U., Ithaca, N.Y.)
NUTRITION WITH GEESE. *Amer. Egg and Poultry Rev. 15:* 75. 1953.—Emden and White China geese were used in the feeding experiment. Both breeds grew slower on the basal diet than those receiving

the basal diet plus niacin (10 or 20 mg. per lb. ration) or dried brewers' yeast (2.5 to 5%). Those fed antibiotic in addition to basal diet showed no growth advantage at the end of 4 weeks. A few of the geese in both breeds receiving the diet also suffered from a bowed leg disorder similar to that which occurs in ducklings. None of the geese receiving niacin or dried brewers' yeast suffered from the bowed leg disorder during the 4-weeks starting period.—*H. G. Lindquist.* (Biological Abstracts)

SIEDLER, A. J., and B. S. SCHWEIGERT. (American Meat Inst. Found., U. Chicago.)

EFFECT OF FEEDING GRADED LEVELS OF FAT WITH AND WITHOUT CHOLINE AND ANTIBIOTIC +B_{12} SUPPLEMENTS TO CHICKS. *Poultry Sci. 32:* 449-454. 1953.—The effect of adding 2,4 or 8% fat (choice, white grease) on rate of gain, food and caloric efficiency of New Hampshire and White Rock chicks for a period of 9 weeks was investigated. A basal ration, formulated from ingredients commonly used in practical type diets, was used, and the addition of choline or choline plus antibiotic and vitamin B_{12} supplement was also studied. 2, 4 or 8% fat added to the basal ration of New Hampshire breed chicks did not change the rates of gain. The calories from fat were efficiently utilized at the 2 and 4% levels but not completely utilized when 8% fat was added. No increase in rate of growth was observed for New Hampshire breed chicks when the rations were supplemented with choline or choline plus an antibiotic and vitamin B_{12}. An increased rate of gain of White Rock chicks occurred during the early phases of the expt. with choline or choline plus antibiotic and vitamin B_{12} supplement, but was not observed in the females at 9 weeks of age. The White Rock males showed a wt. response to choline plus antibiotic and vitamin B_{12} supplementation and also to the addition of 8% fat throughout the expt. Certain observations on the carcass quality and fatty acid composition of the depot fats were made. These results indicate that the performance of chicks fed 2-8% added fat equalled that for chicks fed the basal diet without added fat. At 9 weeks of age little or no advantage attributable to choline or choline plus antibiotic and vitamin B_{12} supplements was observed.—*B. S. Schweigert.* (Biological Abstracts)

SLINGER, S. J., E. S. SNYDER, and W. F. PEPPER. (Ontario Agric. Coll., Guelph, Canada.)

EFFECT OF PENICILLIN IN THE GROWTH OF GOSLINGS. *Poultry Sci. 32:* 396-400. 1953.—Paired groups of White Chinese x Emden goslings were fed a pelleted basal diet and this same diet plus penicillin. Similar groups received these diets plus grain free choice while others were given the same diets and free access to fresh lawn clippings. Penicillin caused growth increases in the groups fed pellets or pellets and grain. These increases were significant in males at 2 weeks of age but not at 4, 6 or 8 weeks of age. The wt. increases in females were not significant. When fresh lawn clippings were before the birds at all times penicillin caused no increase in wt. Feed efficiency was not improved by penicillin. The results indicate that a growth response to penicillin was obtained in the early stages of growth in the absence of fresh green feed. No such response was obtained when fresh green fed was available even in contaminated premises. Penicillin appeared to exert a beneficial effect on the rate of feathering in goslings. In addition, birds receiving the antibiotic consumed more grain in relation to pellets as compared to their controls. Evidence indicates that exptl. groups of goslings should be reared out of sight of one another to prevent their follow-the-leader tendencies from biasing the results.—*S. J. Slinger.* (Biological Abstracts)

SNYDER, J. M., B. CONNOR JOHNSON, and H. M. SCOTT. (U. Illinois, Urbana.)

SURFACE ACTIVE AGENTS AND THE TIME OF THEIR EFFECT ON CHICK GROWTH WITH SPECIAL REFERENCE TO VITAMIN B_{12} AND AUREOMYCIN INTERRELATIONSHIPS. *Poultry Sci. 32:* 527-531. 1953.—The addition of any one of a number of surface active agents did not improve chick growth when added to a corn-

soya diet complete in all known factors. When a "stress" diet, deficient in vitamin B_{12} and containing 60% soybean meal, was supplemented with aureomycin, vitamin B_{12} and Ethomid C/15, in all possible combinations, growth to nine weeks was significantly improved in every instance. The final wts. of the aureomycin and Ethomid C/15 lots were equal but both were inferior to the vitamin B_{12} lot. The combination of aureomycin plus vitamin B_{12} was superior to Ethomid C/15 lots were equal but both were inferior to the vitamin B_{12} lot. The combination of aureomycin plus vitamain B_{12} was superior to Ethomid C/15 plus vitamin B_{12} in promoting chick growth and no advantage accrued from adding the surfactant to the former combination. Both vitamin B_{12} and the surface active agent elicited their responses after the 4th week whereas most of the aureomycin growth response was elicited before the 5th week.—*J. M. Snyder.* (Biological Abstracts)

THAYER, ROLLIN H., and JOE P. DAVIS. (Oklahoma A. and M. Coll., Stillwater.)
B-COMPLEX VITAMIN ALLOWANCES FOR OKLAHOMA BROILER RATIONS. *Bull. Oklahoma Agric. Expt. Sta. B-393.* 1-12. 1953.—Vitamin allowance ranges for broilers under Oklahoma growing conditions were detd. using riboflavin, pantothenic acid, folic acid, niacin and choline. Both synthetic and practical type broiler rations were fed. Recommended vitamin allowance ranges in mg. per lb. based on the results of this feeding test are Riboflavin 5-6.5, niacin 8-16, pantothenic acid 5-6, folic acid 1-1.5, and choline 700 to 800.—*R. H. Thayer.* (Biological Abstracts)

TITUS, HARRY W., ARNON L. MEHRING, JR. (Limestone Products Corporation America, Newton, N.J.), **J. P. MARVEL, G. H. KENNEDY, and J. WADDELL.** (E. I. duPont de Nemours and Co., New Brunswick, N.J.)
THE RESPONSE OF NEW HAMPSHIRE CHICKS TO A FIXED ALLOWANCE OF VITAMIN D. *Poultry Sci. 31:* 39-53. 1953.—The response of 4 strains of New Hampshire chickens to a fixed allowance of vitamin D was studied. All 16 possible types of matings were made. One strain was found to be strikingly different from the other 3: the chicks sired by the males of this strain tended to have a relatively large tibia ash, whereas the chicks from the females of this strain tended to have a relatively small tibia ash. Evidence was obtained that, by pre-testing a number of males and females, it is possible to make matings, the chicks from which will have a tibia ash falling within a compartively narrow range. For a given group of males, females, or matings there tends to be a relatively high correlation between the tibia ash of the chicks in one hatch and the tibia ash of the chicks in a later hatch. In 5 of the 6 pairs of reciprocal matings there tended to be an interaction between tibia ash and gain in live wt. In the chicks produced by one of the "reciprocals" of a pair, a large tibia ash was associated with a small gain, whereas in the other "reciprocal" a small tibia ash was associated with a large gain. There was no significant association between large tibia ash and small gain or between large gain and small tibia ash among the 4 kinds of "pure" matings.—*H. W. Titus.* (Biological Abstracts)

VAVICH, M. G., ANNE WERTZ. (U. Massachusetts, Amherst.), and **A. R. KEMMERER.** (U. Arizona, Tucson.)
GROWTH-STIMULATING FACTORS IN ALFALFA FOR CHICKS. *Poultry Sci. 32:* 433-436. 1953.—Dehydrated alfalfa (Chilean) prepared in the laboratory within 2 to 3 hours after cutting was found to contain a growth-stimulating factor(s) for New Hampshire chicks during the first 4 to 6 weeks of life. The alfalfa was fed at the rate of 3% of the diet. The effect of this factor or factors was enhanced by placing the chicks on a vitamin A-depletion diet previous to placing them on expt. The amt. of casein in the diet did not affect significantly the growth-stimulating property of alfalfa. The same or similar factors were found in brewer's yeast and in sardine meal.—*Authors.* (Biological Abstracts)

ANONYMOUS.
RIBOFLAVIN AND B_{12} INCREASE SQUAB PRODUCTION. *Feedstuffs 25:* 52. 1953.—Work by Grau, Schultz, and Zweigart (Univ. of California, Berkeley) showed that addition of riboflavin and B_{12} to a pigeon diet increased hatchability and livability of squabs. The basal diet was made up of 40% sweet corn, 30% kafir and milo, 20% wrinkled peas and 10% wheat. Additions were: vitamin A, 2280 IU/lb.; vitamin D, 428 ICU/lb.; riboflavin, 1 mg./lb.; vitamin B_{12}, 3.44 μg./lb. Vitamin A and D supplements appeared to be ineffective.—*H. L. Wilcke.* (Biological Abstracts)

PATHOLOGY

AGCAOILI, PABLO B., and TOMAS V. RIGOR. (Bureau of Animal Industry, Manila, Philippines.)
EFFECT OF THE MUKTESWAR STRAIN OF AVIAN PEST VACCINE ON LAYERS: OBSERVATIONS. *Philippine Jour. Anim. Indus. 12 (1-4) 19-27.* 1951.—In an infected flock the loss by death, despite vaccination and injection, was as high as 90.69 per cent, which is the normal mortality rate in the absence of the vaccine. In the non-infected lot, the mortality was 4.76 per cent. A decrease in egg production was noted on the sixth day and the lowest on the eleventh day, 10.47 per cent in the New Hampshire and 16.25 per cent in the S. C. White Leghorn. Broken or floor eggs were highest on the third day and soft-shelled or no-shells on the second day from the date of vaccination. The birds in both lots molted on the fifteenth day.—*F. M. Fronda.*

POULTRY PRODUCTS AND MARKETING

DEL FIERRO, JR., VITO F. (University of the Philippines, College of Agriculture, College, Laguna, Philippines.)
THE LIVE-POULTRY AND EGG MARKETS OF MANILA AFTER WORLD WAR II. *Philippine Agric. 36:* 131-139. 1952.—The kinds of live poultry and eggs sold in Divisoria, Quinta, and Paco, three principal terminal markets for live poultry and eggs in Manila, the places where these products came from, the seasonal fluctuations of supply and demand of these products, and the prices at which they were sold were observed from December, 1948, to November, 1949. The quantity of live poultry and eggs handled did not vary greatly from month to month and consequently seasonal fluctuations in prices of these commodities were very slight. Cebu, Iloilo, Pangasinan, Batangas, and the Bicol provinces were the most important sources of chickens. Ducks came primarily from Rizal, Pampanga, Bataan, and Laguna; turkeys from Pampanga, Rizal, Batangas, and Bulacan. Iloilo and the neighboring provinces of Manila supplied the pigeons. Chicken eggs came chiefly from Bulacan, Pangasinan, Pampanga, Rizal, and Cavite, and duck eggs from Rizal and Laguna. Most of the imported duck eggs came from China.—*F. M. Fronda.*

WINTER, A. R. (Ohio Expt. Sta., Columbus.)
SHOULD SOILED EGGS BE CLEANED THE DAY GATHERED OR THE DAY BEFORE MARKETING? *Amer. Egg and Poultry Rev. 15:* 46, 47, 56, 57, 1953.—Eggs washed the day they are gathered keep a little better than those washed after holding for a week before being washed. A saving in cleaning compound would probably result for a small producer by washing soiled eggs once a week, while the larger producers

would not benefit to any great extent.—*H. G. Lindquist.* (Biological Abstracts)

MANAGEMENT

BAUM, E. L., and H. B. FLETCHER. (State Coll., Washington, Pullman.) APPLICATION OF PROFIT MAXIMIZING TECHNIQUES TO COMMERCIAL FRYER ENTERPRISES. *Poultry Sci. 32:* 415-423. 1953.—Profit-maximizing technics were applied to input-output, cost, and revenue data from 3 case studies to ascertain the extent of applicability of such technics in determining the most appropriate time to market fryers. These technics were found applicable to the 3 commercial fryer enterprises studied. Additional net profits could have been obtained in each of th 3 case studies if the fryers had been held longer. The technic of drawing a sample and the theoretical determination of the sample size yielded a relatively accurate sample (deviation was less than the maximum limit set) when tested. Each fryer firm and/or lot is unique. Therefore, detn. of the most profitable time requires that profit maximizing technics be applied to input-output, cost, and revenue data for each lot. The size of operations, types of buildings and equipment, and the managerial practices employed have a definite effect on net revenue. These factors affect the magnitude of the cumulative feed cost line and the slope of the total revenue curve.—*E. L. Baum.* (Biological Abstracts)

BAUM, E. L., H. B. FLETCHER, H. G. WALKUP, and W. J. STADELMAN. (State Coll., Washington, Pullman.) AN APPLICATION OF PROFIT MAXIMIZING TECHNIQUES TO EXPERIMENTAL FRYER INPUT-OUTPUT DATA. *Poultry Sci. 32:* 375-383. 1953.—Addition of 0.25% animal protein factor (A.P.F.) concentrate to "high-energy" rations fed to fryers yielded input-output curves of significantly greater magnitude than the control rations fed without the concentrate. Fryers fed to heavier weight (greater investment in aggregate feed costs) are more profitable than fryers receiving the same high energy ration (control) without the concentrate. Avg. total revenue per fryer after feed costs were deducted was greater (60.5 and 63.5 cents) for those fryers receiving the A.P.F. concentrate than those fryers not receiving the concentrate (55.5 and 55.5 cents).—*E. L. Baum.* (Biological Abstracts)

DAVIS, GEORGE T., R. J. HYER, L. H. PAULES, and K. B. ELLIS. (Wyoming Agric. Expt. Sta., Laramie.) DUBBING WHITE LEGHORN PULLETS. *Wyoming Agric. Expt. Sta. Mimeo. Circ. 29.* 1-2. 1953.—The effect of dubbing, which consists of trimming the wattles and comb, of young White Leghorn pullets was to increase egg production by approx. 20% and to increase significantly the hatching percentage of their eggs without altering food consumption or mortality. It is suggested (though physiological evidence is not available) that eneregy is lost through normal combs and wattles during cold weather.—*J. F. Reed.* (Biological Abstracts)

NEWLON, W. E., and V. S. ASMUNDSON. THE BROODING AND REARING OF CHICKENS. *Circ. California Agric. Expt. Sta. 425.* 4-38. Illus. 1953.—(Biological Abstracts)

GENERAL

CLANDININ, D. R., and A. R. ROBBLEE. (U. Alberta, Edmonton, Canada.) RADIANT HEATING. I. A RADIANT HEATED POULTRY FARM. *Poultry Sci. 32:* 436-443. Illus. 1953.—A radiant floor heated poultry farm located at the Univ. of Alberta is described. The general heating plan is considered and details on the installations in brooder,

breeding and laying houses are reported. Reference to the suitability of the temp. controls is made.—*D. R. Clandinin.* (Biological Abstracts)

FRONDA, F. M. (University of the Philippines, College of Agriculture, College, Laguna, Philippines.)
THAILAND: I. ANIMAL INDUSTRIES. *Philippine Agric. 36:* 103-113. 1952.—A description of the animal industries of Thailand, including cattle, swine, chicken, and duck production.—*F. M. Fronda.*

HENDERSON, E. W. (Michigan State Coll., E. Lansing.)
IS THE SIZE OF BROILERS AFFECTED BY THE SIZE OF EGGS FROM WHICH THEY ARE HATCHED? *Michigan State Coll. Agric. Expt. Sta. Quart. Bull. 35:* 405-409. 1953.—The following correlation coeffs. were calculated between egg wt. and subsequent pedigreed chick wt. (males at 8 weeks): 24 White Leghorn eggs, + 0.33; 26 Barred Rock eggs, + 0.004; 25 W.L. hen eggs, + 0.04 (Dark Cornish males sired the chicks); 36 Barred Rock eggs, + 0.14 (White Cornish males sired the chicks). None of the coe's. was significant. Another expt. was cited as evidence in which there was no significant difference in the wt. of male chicks at 12 weeks from reciprocally cross-mated Dark Cornish (50-g. egg avg.) and White Leghorn (60-g. egg avg.).—*E. W. Henderson.* (Biological Abstracts)

WORLD'S POULTRY SCIENCE ASSOCIATION

Financial State ent

January 1, 1953 to December 31, 1953

	Dr. Heuser	Major Macdougall
Balance Jan. 1, 1953	$ 1,636.92	£1406-19- 5
Receipts		
Membership	3,151.00	871- 0- 0
Advertising	1,589.22	
Subscriptions	238.00	8- 8- 1
Back Volumes	35.40	
Congress reports	30.92	3-17- 0
Miscellaneous	12.28	
Transfer from Major Macdougall (£1000-0-0)	2,800.00	
TOTAL	$ 9,493.74	£2290- 4- 6
Expenditures		
Printing Journal	$ 1,678.47	
Postage	271.29	22-18- 9
Translations		2-13- 8
Biological Abstracts	28.00	
Clerical and Administration Expenses	653.50	100- 0- 0
Supplies (letterheads, envelopes, stencils, etc.)	162.74	5-12-11
Subscriptions to magazines	23.50	
Editor	400.00	
Associate Editor	200.00	
Expenses, Secretary		62-18- 0
Transfer to Treasurer		1000- 0- 0
Rebate to Branches		46- 0- 2
Transfer to Savings Account	3,000.00	
Miscellaneous		5-14- 4
TOTAL	$ 6,417.50	£1245-17-10
Balance Dec. 31, 1953	$ 3,076.24	£1044- 6- 8
Savings Account		
Balance, Dec. 31, 1952	$ 7,479.53	
Deposits	3,000.00	
Interest	86.14	
Balance, Dec. 31, 1953	$10,565.67	

WORLD'S POULTRY SCIENCE ASSOCIATION

Membership List

January 1, 1954

PATRONS

AUSTRALIA

Commonwealth of Australia, Official Sec, Australia House, Strand London WC 2, England

CANADA

Department of Agriculture, Ottawa

EIRE

Department of Agriculture, The Secretary, Dublin

ENGLAND

The Ministry of Agriculture and Fisheries, 3 Whitehall Place, London SW 1

GERMANY

Ministerium für Landwirtschaft, Weinbau und Forsten, Fischtorplatz 21-23, Mainz

INDIA

The Government of India (The High Commissioner for India, External Dept., India House, Aldwych, London, WC 2, England)

IRAQ

Government of Iraq, Directorate General of Agriculture, Baghdad

NORTHERN IRELAND

Ministry of Agriculture, The Secretary, Stormont, Belfast

SCOTLAND

Department of Agriculture, St. Andrew's House, Edinburgh 1, Scotland

UNION OF SOUTH AFRICA

The Director, Union of South Africa, Government Supply Office, 500 Fifth Ave., New York 18, N.Y., U.S.A.

AFFILIATIONS

AUSTRALIA

Australian Egg Board, 263 Castlereagh St., Sydney, N.S.W. Australia

South Queensland Egg Mkt. Bd., Box 489 H., G.P.O., Brisbane, Queensland, Australia

Secretary, The Egg Marketing Bd., State of New South Wales, P.O. Box 16, Wattle Cresc., Pyrmont, Sidney

Western Australia Poultry Science Assn'., Major G. D. Shaw, Sec., Leake St., Belmont, Western Australia

DENMARK

Danmarks Fjerkraevlerforening, Sortedamsdossering 27, Copenhagen

Faeliesulvalget for Fjergraevl, The Secretary, Farvergade 27, Copenhagen K

ENGLAND

Chilean Iodine Educational Bureau, Stone House, Bishopsgate, London EC 2

Millers Mutual Association, 21 Arlington St., London, SW 1

National Ass'n. of Corn & Agr., Merchants, Cereal House, 58 Mark Lane, London EC 3

National Ass'n. of Poultry Packers, 7/8 Railway Approach, London Bridge, London, SE 1

National Egg Packers Ass'n. Ltd., The Secretary, 7/8 Railway Approach, London Bridge, London SE 1
The Accredited Poultry Breeders Fed. of England & Wales, Ltd., F. Long, Sec., 243 Gray's Inn Road, London WC 1
The National Farmer's Union, Gen. Sec., 45 Bedford Sq., London WC 1
The Poultry Association of Great Britain Ltd., Wigton House 206-212 St. John Street, Clerkenwell, London EC 1

GERMANY

Bergisches Kraftfutterwerk, Hermann Schmidt KG, Weinzenmühlenstr. 12, Düsseldorf-Hafen
Bundesberatungsstelle für Geflügelfütterung, Koblenzer Str. 174, Bonn
Deutsche Kraftfutter gesellschaftdeuka, B. J. Stolp, Speditionstrasse 17-23, Düsseldorf-Hafen
Hertlein & Co., Welzstr. 5, Würzburg
Koudjis' Futterfabrik, Kleve/Rhld
Anton Höing, Kraftfutterwerk "Niedersachsen," Verden/Aller
Verlag Eugen Ulmer, Körnerstr. 16, Ludwigsburg
Fachverband der Futtermittelindustrie, Gr. Bäckerstr. 9, Hamburg 1

HOLLAND

Algemene Nederlandse, Pluimveeteelt Vereniging, Schillerlaan 13, Utrecht
C. V. Trouw & Co., 1 Spinozastraat, Amsterdam C
Nederlandse Pluimvee, Federatie (N.P.F.), Velperweg 53, Arnhem
N. V. Chemische Fabriek, "Noord-Holland", Pijpkade 10, Beverwijk
N. V. Philips-Roxane, Pharm. Chem. Industrie, Duphar, 171-177 P.C. Hoofstraat, Amsterdam

SPAIN

Union Catalana de avicultores y Cunicultores, Rambla de los Estudios, 8-2°, Barcelona

SWEDEN

Svenska Agghandelsforbundet, Forening u.p.a., Kungsgaten 67A, Stockholm
Sveriges Fjaderfaavelsforening, Vasagatan 5, Stockholm

SWITZERLAND

Adroka Limited, Nauenstrasse 63, Basle
Association des Febricants Suisses, d'aliments fourragers, Coppet (Vaud)
Provimi, S. A., Cossonay-Gare, Vaud
Schweizerischer Geflügelzuchtverband, Zollikofen, (Bern)
SEG—Verband Schweizerischer Eier & Geflügelverwertungsgenossenschaften, Glattburg, Zurich
Verband Schweizerischer, Eier-Importeure, Werdtweg 5a, Bern
Verband Schweizerischer Geflügelfarmer, Geschäftsstelle, Seuzach —Zürich

UNITED STATES OF AMERICA

Agricultural Co. of Pan America, R. Walter Bishop, Gen. Mgr., Guilford, Conn.
Allied Mills, Inc., H. J. Buist, Pres., 3400 Bd. of Trade Bldg., Chicago, Ill.
American Chick Sexing Ass'n., S. John Nitta, Gen. Mgr., Line & Prospect Avenues, Lansdale, Pa.
American Excelsior Corp., A. J. Koehneke, Pres., 1000 North Halsted St., Chicago 22, Ill.
American Feed Mfgrs. Ass'n., W. E. Glennon, Pres., 53 West Jackson Blvd., Chicago 4, Ill.
American Machine & Foundry Co., Clayton DuBosque, Jr., 511 Fifth Ave., New York 17, N.Y.
American Poultry Ass'n., Inc., L. H. Ritzhaupt, Pres., Box 968, Oklahoma City, Okla.

American Poultry and Hatchery Federation, D. M. Turnbull, Secy., 521 E. 63rd St., Kansas City 10, Mo.
American Poultry Journal, H. G. Eisert, Publisher, 536 South Clark St., Chicago, Ill.
Amer. Scientific Labs. Inc., Hubert D. White, Pres., 4001 Sherman Ave., Box 232, Madison, Wis.
Anderson Box Company, Norb Schaefer, Vice-Pres., 700 West Morris St., Indianapolis 6, Ind.
Arkansas Broiler Hatchery, L. M. Chemell, Mgr., 251 North Gregg, Fayetteville, Ark.
A. R. Wood Mfg. Co., A. R. Wood, Pres., Luverne, Minn.
A. Sturm & Sons, Manawa, Wis.
Barker Poultry Equipment Co., Seth S. Barker, Pres., P.O. Box 336, Ottumwa, Iowa
Birds Eye Div. Gen. Foods Corp., A. S. Inglehart, Pres., 383 Madison Ave., New York, N.Y.
Blue Star Foods, Inc., David J. Kaplan, Pres., P.O. Box 420, Council Bluffs, Iowa
Byard V. Carmean, Inc., Byard V. Carmean, Pres., Laurel, Del.
Central Fibre Products Co., E. P. Lannan, Sec., 901 S. Front Street, Quincy, Ill.
Chas. Pfizer & Co. Inc., J. E. McKeen, Pres., 630 Flushing Ave., Brooklyn, N.Y.
Chester B. Franz, Inc., Chester B. Franz, Pres., 1100 North 6th St., St. Louis 1, Mo.
Chick Master Incubator Co., Joseph I. Taggart, Mgr., 3212 West 25th St., Cleveland 9, Ohio
Clements Bros. Farms, Norris C. Clements, Owner, Winterport, Maine
Cobb's Pedigreed Chicks, Inc., Robert C. Cobb, Sr., Pres., R.D. 2, Concord, Mass.
Consolidated Products Co., D. Lewis, Pres., 119 N. Washington Ave., Danville, Ill.
Cosby-Hodges Milling Co., L. A. Brooks, Vice-Pres., 1501 First Ave. South, Birmingham, Ala.
Creighton Brothers, Hobart Creighton, Pres., Route 5, Warsaw, Ind.
Cudahy Packing Co., A. F. Perrin, Vice-Pres., Union Stock Yards, Omaha 7, Nebr.
Dawe's Manufacturing Co., C. C. Dawe, Pres., 4800 S. Richmond St., Chicago 32, Ill.
Dekalb Agricultural Association, Inc., George Hyde, President, 310 N. 5th St., Dekalb, Ill.
Dr. Salsbury's Laboratories, J. E. Salsbury, Pres., Charles City, Iowa
Everybody's Poultry Magazine Publishing Co., R. B. Alleman, Pres., Exchange Pl., Hanover, Pa.
F. M. Stamper Co., St. Louis, Mo.
Ghostley's Poultry Farm, George F. Ghostley, Anoka, Minn.
Gordon Johnson Co., Gordon W. Johnson, Pres., 2519 Madison, Kansas City, Mo.
Hales and Hunter Co., L. G. Neel, 141 West Jackson Blvd., Chicago 4, Ill.
Hall Brothers Hatchery, Inc., A. B. Hall, Pres., Cook Hill, Wallingford, Conn.
Henningsen Bros. Inc., V. M. Henningsen, Jr., 347 Madison Ave., New York 17, N.Y.
Honeggers' Breeder Hatchery, Forrest, Ill.
Idaho Egg Producers, Archie M. Larson, Pres., Box 771, Caldwell, Idaho
I. D. Russell Co. Labs., I. D. Russell, Pres., 2463 Harrison St., Kansas City 10, Mo.
Independence Produce Co., John J. Yundt, Pres., Independence, Iowa
Indian River Poultry Farm Inc., George Ellis, Pres., Lancaster, Pa.
Institute of Am. Poultry Industries, 221 No. LaSalle Street, Chicago 1, Ill.

James Mfg. Co., E. R. Klassy, President, 104 W. Milwaukee Ave., Fort Atkinson, Wis.
J. D. Jewell Inc., J. D. Jewell, Pres., Box 642, Gainesville, Ga.
Kazmeier Poultry Farm, F. W. Kazmeier, Owner, Bryan, Texas
Larro Research Farm, General Mills Inc., T. T. Milby, 20521-10½ Mile Rd., Detroit 19, Mich.
Mapes Consolidated Mfg. Co., H. C. Mapes, Pres., Griffith, Ind.
Marshall Produce Co., N. Ben Weiner, Pres., Box 455, Marshall, Minn.
Melini's Vineland Farms Hatchery, Inc., Oak Rd. & Delsea Drive, Vineland, N.J.
Merck & Co., Inc., A. Zeissig, Veterinary Research Dept., Rahway, N.J.
Michigan State Poultry Improvement Association, H. C. Zindel, East Lansing, Mich.
Mid-Central Egg Products Inc., Ira Rosenblum, Pres., 601 East 3rd St., Kansas City 6, Mo.
Miller Mfg. Co., Inc., 251 W. Kellogg Blvd., St. Paul 2, Minn.
New Hampshire Egg Producers Coop., J. Harold Ek, Manager, Derry, N.H.
New York Mercantile Exchange, L. Watts, Jr., 16 Harrison St., New York 13, N.Y.
Nichols Poultry Farm Inc., N. Nichols, President, Kingston, N.H.
Nopco Chemical Co., Inc., C. I. Post, Gen. Mgr., Vitamin Division, Harrison, N.J.
Norbest Turkey Growers Assn., Carl W. Mason, Pres., P.O. Box 1529, Salt Lake City, Utah
Northeastern Poultry Producers Council, 11 W. State St., Trenton, 8, N.J.
O. G. Harp Poultry & Egg Co., O. G. Harp, Pres., Shawnee, Okla.
Omaha Cold Storage Co., H. S. Sheridan, Pres., 801 Farnam St., Omaha 8, Nebr.
Oregon Egg Producers, Lawrence Luy, Pres., 306 S.E. Ash, Portland 14, Oregon
Otto Niederer Sons, Inc., Otto C. Niederer, Jr., Pres., Titusville, N.J.
Ovson Egg Company, Morris Ovson, Pres., 455 E. Grand, Chicago 90, Ill.
Oyster Shell Products Corp., 271 North Ave., New Rochelle, N.Y.
Park & Pollard Co., L. E. Bartlett, 356 Hertel Ave., Buffalo, N.Y.
Parks Barred Rock Farm, Juniata Gap, Altoona, Pa.
Peter Hand Foundation, H. P. Heuer, Pres., 1000 W. North Ave., Chicago 22, Ill.
Philip R. Park, Inc., Mrs. G. H. Beckwith, Berth 42, Outer Harbor, San Pedro, Calif.
Pilch's Poultry Farm, Chester W. Pilch, P.O. Box 276, Thompsonville, Conn.
Poultry & Egg, National Bd., John C. Huttar, Pres., Suite 214, 185 N. Wabash Ave., Chicago 1, Ill.
Poultry Dept. Farmers Mutual Inc., M. C. Kennett, 801 Gilbert St., Durham, N.C.
Poultry Producers of Central California, R. R. Hyatt, Pres., 840 Battery St., San Francisco 11, Calif.
Poultry Science Ass'n., T. B. Avery, Sec., Poultry Dept., Manhattan, Kan.
Priebe & Sons, Inc., Frank A. Priebe, Pres., 110 N. Franklin St., Chicago 6, Ill.
Producers Dist. Agency Inc., B. I. Brown, Pres., 40 Gansevoort St., New York 14, N.Y.
Producers Produce Co., Ed Steury, Pres., P.O. Box 309, Springfield, Mo.
Ralston Purina Company, J. D. Sykes, Vice-Pres., Checkerboard Square, St. Louis 2, Mo.
Rockingham Poultry Mkt. Co-op., R. B. Strickler, Pres., Broadway, Va.
S. B. Penick and Company, S. B. Penick, Pres., 50 Church St., New York 8, N.Y.

The Borden Company, Special Products Division, 350 Madison Ave., New York 17, N.Y.
The Glidden Company, 1160 West 18th St., Indianapolis 9, Ind.
The Grange Company, Arlo V. Turner, Pres., P.O. Box 860, Modesto, Calif.
The North Carolina Granite Corp., John P. Frank, Pres., Lock Drawer 151, Mount Airy, N.C.
The Pioneer Hatchery, E. A. Nisson, Pres., 418—6th St., Petaluma, Calif.
The Quaker Oats Co., Donald B. Lourie, Pres., Merchandise Mart Plaza, Chicago 54, Ill.
Titman Egg Company, Benjamin Titman, Pres., 105 Hudson St., New York 13, N.Y.
Ultra-Life Laboratories Inc., E. C. Andrews, Pres., 3500 Walnut St., East St. Louis, Ill.
Uncle Johnny Mills, H. J. Konen, Pres., 1804 Sawyer, Box 236, Houston, Texas.
Vineland Poultry Laboratories, A. D. Goldhaft, P.O. Box 70, Vineland, N.J.
Virginia State Poultry Federation, C. G. Lindsey, Pres., 615 E. Franklin St., Richmond 19, Va.
Vitality Mills, Inc., W. N. Jones, Vice-Pres., 2020 Bd. of Trade Bldg., 141 W. Jackson Blvd., Chicago 4, Ill.
Waldorf Paper Products Co., P. A. Schilling, Pres., 2250 Wabash, St. Paul 4, Minn.
Watt Publishing Co., Leslie A. Watt, Pres., Mount Morris, Ill.
Western Hatcheries, Inc., Joe Fechtel, Pres., 1407 North Industrial, Dallas, Texas
Whitmoyer Labs., Inc., C. W. Whitmoyer, Pres., Myerstown, Pa.

MEMBERS

ALGIERS

Yan Derrien, Village Celestie, Bouzaree

AUSTRALIA

C. F. Anderson, Dept. of Agr., Box 901E, G.P.O. Adelaide, South Australia
A. M. Bell, % Albany Bells Hatchery, Mt. Lawley, Western Australia
N. Bell, Fulham St., Belmont, Western Australia
V. H. Braun, Dept. of Agr., Farrer Place, Sydney, New South
Self-Locking Carton Div. of Shellmar Products Corp., 589 E. Illinois St., Chicago 11, Ill.
Sell's Specialties, Inc., Henry B. Sell, Pres., 730 Fifth Ave., New York 19, N.Y.
Southeastern Poul. & Egg Assoc., R. G. Purnell, Pres., 615 E. Franklin St., Richmond 19, Va.
Staley Milling Co., Thomas W. Staley, Gen. Mgr., 1717 Armour Rd., Kansas City 16, Mo.
Swift & Company, W. P. Ayres, Vice-Pres., Union Stock Yards, Chicago 9, Ill.
Tennessee Egg Co., Inc., 414 West 16th St., Chattanooga, Tenn.
The Beacon Milling Co., Inc., Stanley W. Tyler, Pres., Cayuga, N.Y.
Wales
C. A. Corselis, Editor, Poultry, P.O. Box 9, Haymarket, Sydney
Dept. of Agr. & Stock, William St., Brisbane, Queensland
Mrs. M. I. Edgley, 151 Kooyong Rd., Toorak, SE 2, Victoria
Alfred Hampton, Scott Street, Kewdale, Western Australia
R. Harrison, Grant St., Scarborough, Western Australia
Thomas Lewis, "Riverside," Castlereagh, New South Wales
I. R. McCann, Crowlands Road, Stawell, Victoria
J. J. McLachlan, Dept. of Agriculture, Townsville, Queensland
A. W. Oughton, Forrestfield, Western Australia
Poultry Farmers Cooperative Society, Box No. 743K, G.P.O., Brisbane

G. D. Shaw, Leake St., Belmont, Western Australia
Paul Smetana, Hector St., Tuart Hill, Western Australia
F. Skaller, The Librarian, C.S.I.R.O., Animal Research Laboratory, Parkville, Victoria
N. T. Wilkinson, Sydenham Street, Rivervale, Western Australia

AUSTRIA

Dr. O. Hubner, Mittendorf a.d. Fische, Vienna

BELGIAN CONGO

G. Hosli, B.P. 186, Albertville
F. Van Parys, Quai du Commerce, Boite Postale 15, Boma

BELGIUM

Georges Bohez, Statiestraat 68, Olsene
S. H. Buys, 36 rue Ernest Gossart, Bruxelles
H. Boudringhien, 17, Kerkstraat, Olsene
Jean de Winter, 67, Meir, Antwerp
J. Camerlinckx, 48 Platteloostraat, Kessel-Lo
N. C. De Rycke, Firma De Ryke, 59 Stationstreet, Gavere
Jules Dujardin, 29 rue de la Bouverie, Paturages
L. Geurden, Plateaustraat 24, Ghent
L. Gillot, 73, Rue de Puagne, Sart Eustache
R. Godart, 2, Rue aux Cailloux, Rhisnes
Cyr. Joye, 263 Beverenstraat, Lichtervelde
Jules Lenaerts, 137 rue de Namur, Wavre
N. Reyntens, Rijkstation Kleinveetelt, Melle
L. Standaert, 45, Statiestraat, Landegem
Chales Van Goethem, 22 Bischopstraat, Antwerp
J. Van Ingelgem, 86, Avenue des Mimosas, Woluwé St. Pierre, Brussels
S. Vassart, 60, Rue Mazy, Jambes
Jan Wijverkens, 134 St-Rochusstraat, Hal, Brabant
A. E. R. Willems, Veterinary School, Casinoplein 11, Ghent
René Willems, Laboratoire Recherches Vétérinaires, rue Groeselenberg, Uccle.

BRAZIL

John Wilson da Costa, Caixa Postal 3706, Rio de Janeiro
Roberto B. Costa, Rosaria 156, Rio de Janeiro
W. Kupsch, 2583 Av. Paulista, App. 86, Sao Paulo

BRITISH WEST INDIES

J. R. Howes, I.C.T.A., St. Augustine, Trinidad

CANADA

J. R. Aitken, Poultry Division, Central Exp. Farm, Ottawa
S. C. Barry, Chief, Livestock Prod. Div., Marketing Service, Ottawa
Wilbrod Beaupre, P.O. Box 38, U.T. Quebec
Jacob Biely, Univ. of British Columbia, Vancouver
George Blais, 2830 Gomin Road, Ste. Foy, Quebec
H. D. Branion, Ontario Agr. College, Guelph
F. W. Bray, 120 John St., North, Hamilton, Ontario
Jacques de Broin, Feed Div. Purity Flour Mills Ltd., P.O. Box 1, Stn. E., Montreal 14, Que.
J. I. Brown, Canadian Produce Assoc., Box 222, Montreal
W. W. Brown, Saskatchewan Poultry Board, Sask. Co-op. Creamery Bldg., Regina, Sask.
A. Brunton, Brunton Farms, Port Perry, Ontario
Canadian Produce Council, A. Wilson, Sect'y-Treas., P.O. Box 924, Moose Jaw, Sask.
N. Catto, Dewittville, Quebec
J. R. Cavers, Poultry Dept., Ont. Agr. College, Guelph, Ont.
J. K. Clarke, Buckerfield's Ltd., Ft. Rogers St., P.O. Box 219, Vancouver, B.C.
R. H. Common, Box 223, Macdonald College, P.Q.
H. R. Cook, % Toronto Elevators Ltd., P.O. Box 370, Sta. A, Toronto
A. D. Davey, Poultry Services, Dept. of Agriculture, Ottawa

H. B. Donovan, Jr., 214a Adelaide St. W., Toronto 1, Ont.
Donald Ells, Sec.-Treas., Cyrus & Manning Ells Ltd., Port Williams, Nova Scotia
A. R. G. Emslie, Science Service, Dept. of Agriculture, Ottawa, Ont.
I. H. Fisher, Ayton, Ont.
L. Foisy, Dept. of Agriculture, Oka, Quebec
D. C. Foster, Extension Service, Dept. of Agriculture, Winnepeg
C. L. Goddard, Goddard Chick Hatcheries, Chatham, Ontario
H. S. Gutteridge, Chief, Poultry Division, Central Exp. Farm, Ottawa
Jacques Hardy, Scudder, Pelee Island, Ont.
Wm. M. Hawley, Poultry Field Serv., Brackman-Ker., Box 920, New Westminster
N. Heneault, Room 1004, 685 Cathcart St., Montreal
A. T. Hill, Derreen Poultry Farm, R.R. 2, Sardis, B.C.
G. C. Hodgson, 84 Chestnut St., Winnipeg, Man.
N. D. Hogg, 554 Yonge St., Toronto
C. H. Huctwith, Forest, Ont. (Life Member)
J. D. Ironside, Box 1130, Swift Current, Saskatchewan
F. N. Jerome, Poultry Dept., Ontario Agricultural College, Guelph, Ont.
A. S. Johnson, Central Experimental Farm, Department of Agriculture, Ottawa
P. A. Kondra, Poultry Dept., University of Manitoba, Winnipeg, Manitoba
G. L. Landon, 70—8th St., New Westminster, B.C.
R. LaPointe, 5519 First Ave. Rsmt., Montreal
D. H. Laughland, Science Service, Dept. of Agriculture, Ottawa, Ont.
Bro. M. Laurent, La Trappe, P. Que.
E. M. Lowden, B.C. Turkey Assoc., 618 Columbia St., New Westminster, B.C.
J. C. Mackenzie, Box 760, New Westminster, B.C.
C. G. MacLennan, P.O. Box 69, Truro, N.S.
W. A. Maw, Macdonald College, Quebec
Mrs. N. McCulloch, Vancouver Island Turkey Improvement Assn., Langford, P.O., V.I.B.C.
D. McLaren, Burns & Co., Ltd., Calgary, Alta.
R. H. McMillan, 11823—76th Ave., Edmonton, Alberta
S. L. Morantz, 260 Main St., Winnepeg
M. W. Morfey, Mgr., Nanaimo & District Coop., Egg & Feed Assn. P.O. Box 367, Nanaimo, B.C.
H. F. Murwin, Dominion Exp. Farm, Harrow, Ont.
Mrs. A. P. Musselman, 12 Dunke St., Elmira, Ont.
J. W. Nivison, Surrey Coop. Assoc., Cloverdale, B.C.
J. B. O'Neil, Poultry Dept., Univ. of Saskatchewan, Saskatoon
Ella Onnen, 558 West 17th St., Vancouver, B.C.
A. E. Palmer, Supt., Dominion Exp. Station, Lethbridge, Alta.
F. E. Payne, Poultry Comm., Dept. of Agr., Regina, Saskatchewan
J. M. Pearce, Derreen Poultry Farm, R.R. 2, Sardis, B.C.
W. R. Pearce, Pres., Nova Scotia Poultry Council, Quinta Acacia Farm, Sheffield Mills, N.S.
Ernie Peden, Scott & Peden Ltd., P.O. Drawer 939, Victoria, B.C.
R. A. Peel, Port Perry, Ont.
Harvey Pettit, Poultry Department, Ontario Agr. Coll., Guelph
H. Pope, Poultry Branch, Dept. of Agr., Parliament Bldgs., Victoria, B.C.
F. W. Presant, Feed Division, Toronto Elevators Ltd., Queen's Quay, Toronto
E. S. Robert, St. Adele, Quebec
R. V. Robinson, B. C. Feed Mfg. Assoc., 608, 355 Burrard St., Vancouver, B.C.
D. M. Shaver, R.R. 1, Box 194, Galt, Ont.
S. J. Slinger, Poultry Dept., Ontario Agricultural College, Guelph, Ont.

E. S. Snyder, Poultry Dept., Ontario Agr'l. College, Guelph
J. H. Strain, Box 18, Lawson, Sask.
The Fisher Orchards, R.R. 2, Burlington, Ont.
The Superintendent, Dominion Experimental Farm, Nappan, N.S.
Miss D. G. Taylor, % Royal Bank of Canada, New Westminster, B.C.
Jack Tweddle, Tweddle Chick Hatcheries Ltd., St. David's St., Fergus, Ont.
H. E. Upton, Box 33, 739 Victoria Ave., White Rock, B.C.
W. J. Wakely, Poultry Inspector, 70 Eighth St., New Westminster, B.C.
Western Canada Produce Assoc., A. Wilson, Secty-Treas., P.O. Box 924, Moose Jaw, Sask.
F. A. Wiggans, 300 Dawlish Ave., Toronto, Ont.
G. R. Wilson, Poultry Division, Dept. of Agriculture, Ottawa
F. Leslie Wood, Dir., Poultry Service, Dept. of Agriculture, Fredericton, N.B.

CHILE

Juan Gazman Castro, Casilla 40, Buin

CHINA

Jen Hwang, Dept. Animal Husb., and Vet. Science, National Taiwan Univ., Taipei, Taiwan (Formosa)

COSTA RICA

Jaime A. Guell P., El Semillero, Ltda., Apartado Postal No. 329, San Jose

COLOMBIA

Hernando Barriga Borrero, Apartado Aereo No. 10-52, Cartagena
Pablo Hoffmann, Apartado nacional No. 21-48, Medelin
Miss S. McCowen, % Min. de Agr. y Lanaderia, 40 Piss Ave., Caracas, Callego, Bogota
Bladimiro Renteria Potes, Carrera 9a Nos. 10-73 y 10-71, Cali

DENMARK

Vald. Adsersen, Lab. Fjerkraeundersogelser, Royal Vet. & Agr. College, Copenhagen
J. Baelum, Agricultural Research Laboratory, Rolighedsvvej 25, Copenhagen V
Aage Christensen, Hoirisvej 3, Riiskov
C. Christiansen, Skalborg Kontrolhonseri, Skalborg
Dansk Andels Aegexport, Axelborg, Copenhagen, V
David Davidsen, Peter Bangsvej 191, Valby, Copenhagen
Mogens Fog, Gudbjerg Skov pr, Gudme, Fyn
C. Fredericksen, Vodroffsvej 61, Copenhagen
V. Hagerup, Hulsoevang 15, Rungsted Kyst
Jens Kr. Hansen, "Fionia," Holmstrup
Mr. & Mrs. H. Hollesen, Havelsehus, Pr. Olsted Sj.
Hogsbro Holm, Landbrugsraadet, Axelborg, Copenhagen
A. Thoesing Joergensen, Ringsted
W. A. Kock, Lykkevej 9, Charlottenlund (Honorary Life Member)
Miss Inger Larsen, Hojager, Landerslev pr, Krogstrup
Tage Larsen, Nr. Broby
T. Lohse, Statskontrollen med Smo og Aeg., Christiansgade 22, Copenhagen
H. Mortensen, Hoyrups Alle 1, Hellerup
Elias B. Muus, Fredericksgade 2-4, Odense
Oluf Nielsen, Frederiksborgwej, Roskilde
E. Riisberg, 19 Bronshajvej, Copenhagen
W. Roe, A/S Kenmovit, 72 Blegdamsvej, Copenhagen
Aage Svendsen, Odense Aegforretning A/S, Bornholmsgade 1, Copenhagen, K
A. V. Tachau, Overlund, Viborg
J. Traberg, Storehedinge
P. Ulrik, Blitah Park 23, Charlottenlund

EAST AFRICA

R. L. Thompson, Blue Hills, P.O. Bix 66, Kiambu, Kenya

EIRE

F. C. Combe, 120 Merrion Road, Ballsbridge, Dublin
Miss Jane Cox, 13 Appian Way, Dublin
Eggsport Limited, 65 Gardiner Street Lower, Dublin
Major L. Gardner, Ideal Poultry Farms Ltd., Ballino Co., Mayo
G. Gordon, Knocknagarn Poultry Products, Killiney Co., Dublin
Miss R. Grehan, 2 Seatown Place, Dundalk, Co. Louth
A. J. Hennerty, Dept. of Agriculture, Upper Merrion St., Dublin
Miss A. Nunan, 28 The Square, Listowel
Miss Una O'Donoghue, The Munster Institute, Cork
D. Philpott, Department of Agric., 16 Upper Mount St., Dublin
B. H. Roberts, Ballyanna, Ballycotton, County Cork
B. J. Senior, Albert Agr. College, Ballymun Road, Glasnevin, Dublin
P. P. Walsh, 19 Laburnam Lawn, Model Farm Road, Cork
Mrs. H. M. Williamson, Royal Meath Chicks, Randelstown, Co. Meath

ENGLAND

Miss D. Margaret Abbatt, National Agr. Adv. Serv., Underfell, Kendal, Westmoreland
Miss M. D. Allan, Elvet House, Hallgarth Street, Durham
W. M. Allcroft, Breydon, Blackdown Avenue, Pyrford, Surrey
J. Amsden, Stud Farm, Weald, Near Sevenoaks, Kent
J. M. Angell, Brockworth, Gloucester
L. B. Ashforth, Sterling Poultry Products, Limited, Mowden Lodge, Darlington, Co. Durham
R. H. Axworthy, The Standard Laboratory, 45 Castle Street, Reading, Berkshire
Miss M. A. Bacon, St. Norberts Lodge, Fern Road, Storrington, Sussex
C. J. L. Baker, Nutrition Chemistry Department, Ministry of Agriculture, Anstey Hall, Trumpington, Cambridge
Tj. Bakker, Med. Vet. (Utrecht), Royal Netherlands Embassy, Hereford House, 117, Park Street, London, W 1
A. Barker, % F.M.S. (Farm Supplies), Limited, Cereal House, Mark Lane, London, EC 3
Miss D. K. Barnicott, National Agricultural Advisory Service, Blagdon Lodge, Middleway, Taunton, Somerset
J. W. Barrett, "Kintyre," Station Road, Southwold, Suffolk
Tom Barron, The Poultry Farm, Catforth, Near Preston, Lancashire
George W. Batt, Hillcroft Farm, Tylers Green, Penn, Buckinghamshire (Life Member)
W. G. Bayliss, The Pillars Farm, Chipping Norton, Oxfordshire
N. H. Beeston, Quaker Oats, Ltd., Southall, Middlesex
Mrs. E. C. Belcher, The Thatched Cottage, White Stone, Nuneaton, Warwicks
J. K. Belcher, The Thatched Cottage, White Stone, Nuneaton, Warwickshire
Alan Bell, Poultry Services, Ltd., Marsden Road, Welwyn, Garden City, Hertfordshire
J. A. Bethell, Purley Park Poultry Farm, Nr. Reading, Berkshire
F. G. Bevin, Denstone, Shireburn Road, Freshfield, Lancashire
H. R. Binder, Priory Lodge, Leeds Road, Harrogate, Yorkshire
Victor Birtwistle, 3, Clarence Street, Trawden, Colne, Lancashire
C. Duvall Bishop, Sevenacres, Tewin, Welwyn, Herts.
D. J. G. Black, The University, Reading, Berkshire
W. C. Blacklocks, Bays, Lydd, Kent
Major V. S. Bland, The Warren, Aldbourne, Marlborough, Wiltshire
J. D. Blaxland, Veterinary Laboratory, Ministry of Agriculture, New Haw, Weybridge, Surrey
W. P. Blount, Advisory Service, 2, Kingscote Street, London, EC 4
Albert Booth, "Wanslea," Church Avenue, Humbertson, Grimsby, Lincolnshire
E. W. Bower, 49, Whitney Road, Burton Latimer, Kettering, Northants

G. C. Brander, The Cooper Research Station, Berkhamsted Hill, Berkhamsted, Herts.
R. D. H. Bridge, Ministry of Agriculture, Wareham Road, Dorchester
British Proximi Co. Limited, (L. A. Mantle), 17, New Wharf Road, King's Cross, London, N 1
H. T. Brook, % R. Silcock & Sons Ltd., Edmund Street, Liverpool 3
H. N. Brooke, Wayside Poultry Farm, Burnley Road, Luddenden Foot, Nr. Halifax, Yorkshire
Brooks (Mistley) Ltd., Mistley Manningtree, Essex
H. A. Broomhead, "Poultry," Commercial Road, Bournemouth, Hampshire
Miss S. M. Bunce, British Oil and Cake Mills, Ltd., 2 Kingscote St., London, EC 4
G. E. Burkitt, Ministry of Agriculture, "Crete Hill," Westbury-on-Trym, Bristol
M. Butchart, Kettles Farm, Mickfield, Stowmarket, Suffolk
Anthony Buxton, Department of Veterinary Pathology, The University, 42/44, Bedford Street North, Liverpool
W. Carr, 2 Annandale Road, Croydon, Surrey
Miss M. J. Carter, 127, Northgate Street, Bury St. Edmunds, Suffolk
Desmond E. Chandler, Chandler's Hatcheries, Ltd., Harlaxton, Grantham, Lincs.
Austin Champeney, Cheddar Valley Poultry Farm, Theale, Wedmore, Somerset
Noel R. Chaplin, Ministry of Agriculture, Agricultural Institute, Kirton, Boston, Lincs.
F. R. Cheeseman, Southdown Hatcheries, Uckfield, Sussex
L. G. Chubb, Poultry Research Division, Animal Health Trust, Houghton Grange, Houghton, Hunts.
G. T. Church, The Surrey Hatchery, Ferndale Avenue, Chertsey, Surrey
Miss M. E. Coates, National Institute for Research in Dairying, Shinfield, Reading, Berkshire
R. Coles, Ministry of Agriculture, 1/4, Cambridge Terrace, Regent's Park, London NW 1
Miss D. M. Cooper, Animal Health Trust, Poultry Research Station, Houghton, Huntingdonshire
A. E. Cope, Hedgeroms, Putnoe Street, Goldington, Bedfordshire
Miss F. M. Cordle, Norfolk Agr. Exec. Com., Vancouver House, King's Lynn, Norfolk
D. G. Cowling, 283, Kirkgate Market, Leeds 2
F. R. W. Craddock, Commerce House, 8, Blagrave Street, Reading, Berks.
W. A. Crawford & Son, Dormers, Saham Toney, Thetford, Norfolk
J. Craven-Sykes, Wylie & Craven-Sykes, Ltd., 51, High Street, Hailsham, Sussex
T. J. Crocker, Ministry of Agriculture, Wareham Road, Dorchester, Dorset
Miss E. M. Cruikshank, Dunn Nutritional Laboratory, Milton Road, (Field Laboratories), Cambridge
Miss K. M. Crutcher, Ministry of Agr., Elmbridge Court, Gloucester
Alan W. Davies, Poultry Research Station, Houghton, Huntingdonshire
H. E. Davies, Lever's Cattle Foods, Limited, Wood Street, Bebington, Cheshire
J. T. Davies, Weatherstones, Neston, Wirral, Cheshire
Miss W. C. Davies, Litley Court, Hereford
N. Dobson, York Cottage, Pirbright, Surrey
Alfred Dooley, Henfold Hill, Beare Green, Dorking, Surrey
H. H. Duckett, "Beacon Croft," St. Agnes, Cornwall
F. J. Dudley, National Institute of Poultry Husbandry, Newport, Shropshire
T. J. Duke, Abbey Mill, Bishop's Waltham, Southampton, Hampshire

Vic Hallam, Vic Hallam Ltd., Langley Hill, Nottingham
A. A. Eastwood, County Farm, Stoke Mandeville, Aylesbury, Buckinghamshire
James Edmondson, Northern Breeding Station, Reaseheath, Nantwich, Ches.
Joe Edmondson, Park Lodge, Hankelow, Crewe, Cheshire
Henry Eisen, 71, Fleet Street, London, EC 4
W. M. Elkinton, Milford, Godalming, Surrey
R. Ellis, Manor Farm, Hart, West Hartlepool. Co. Durham
C. C. Ernst, High Birch Poultry Farm, Weeley Heath, Clacton, Essex
A. & W. Evans Limited, 16-20, St. Nicholas Street, Leicester
W. D. Evans, Hilly Farm, Burton Latimer, Nr. Kettering, Northants
Victor E. W. E. Eves, 9/10 Railway Approach, London Bridge, London, SE 1 (Life Member)
D. E. Eyles, % Mrs. Finch, 74 Cox Green Road, nr. Maidenhead, Berks.
G. B. Fairbairn, % E. F. Fairbairn, Ltd., Caldewgate, Carlisle, Cumbs.
R. J. Fant, I.C.I. Game Services, Burgate Manor, Fordingbridge, Hampshire
R. P. Feltwell, National Agricultural Advisory Service, Marston Road, Oxford
L. Finch, "Trees," Stansted, Essex
F. S. Finney, Milne Holme Poultry Farm, Halifax Road. Todmorden, Lancs.
J. L. Finney, Northern Counties Accredited Hatchery, Lt., Eastwood, Near Todmorden, Lancashire
R. M. Fleming, National Agr. Adv. Service, Block "C" Red Hill, Worcester
L. A. Forscey, 19, Belton Lane, Grantham, Lincolnshire
Captain C. A. Fowke, Oakhurst, Marchwood, Nr. Southampton
D. E. Fraser, Kinsmore, St. Albans Road, Garston, Watford, Hertfordshire
W. Gardner, Undercroft, Near Lancaster, Lancashire
C. Gerrish, The Wiltshire Hatchery, Hilperton Marsh, Nr. Trowbridge, Wilts.
H. B. Gibson, Pilgrims, Little Baddow, Nr. Chelmsford, Essex
Mrs. W. D. Gibson, Floshgate, Ullswater, Penrith, Cumberland
Gerald Gill, Sandy Hatch, Cliff Road, Hythe, Kent
R. J. Girling, Larges Farm, Great Holland, Frinton-on-Sea, Essex
E. F. Golden, White Lady Poultry Farms, Limited, Fifield Road, Maidenhead, Berks.
C. W. Goode, Ministry of Agriculture, Government Buildings, Lawnswood, Leeds, 6
R. F. Gordon, The Animal Health Trust, Poultry Research Station, Houghton Grange, Houghton, Huntingdonshire
H. Greenall, Oversease Egg and Produce Co. Limited, Empire House, Duke Street Hill, London, SE 1
Captain F. S. Gregory, Burnt House, Burwash, Sussex
R. J. Grimsey, Sylvan Dene, Foxendown Road, Meopham, Kent
F. H. Grove, Hall-Mark Hatcheries, Limited, Wickford, Essex
F. H. Guernsey, National Agricultural Advisory Service, Chiltern Court, St. Peters Avenue, Caversham, Reading, Berkshire
Gordon Guttridge, Ballspond Farm, Chipperfield Road, King's Langley, Herts.
Murray Hale, 46, Guithavon Road, Witham, Essex
Brodie Halford, Little Manor, Longstock, nr. Stockbridge, Hampshire
Capt. E. T. Halnan, School of Agriculture, Cambridge
Lady Hannon, 1, Westminster Gardens, London SW 1
Miss A. M. Harborne, Windyridge, Ettington, Stratford-on-Avon, Warwickshire
George Harling, Sandside Poultry Farm, Milnthorpe, Westmorland
H. G. S. Harris, Southernhay Poultry Farm, Great Glen, Leicestershire

G. F. Harrison, National Institute for Research in Dairying, Shinfield, Near Reading, Berkshire
C. J. Harrison, The Old Vicarage, Holbeach Hurn, Spalding, Lincolnshire
F. B. Hart, The Garth, Blackbrook, Dorking, Surrey
W. D. Hartley, The Globe and Church Farms, Wellow, Bath, Somerset
J. Harvey, % H. R. Behling, Ltd., 412 High Road, Leytonstone, London E 11
J. R. Harvey, 14, Maxwell Rise, Oxhey, Watford, Hertfordshire
Henry Page and Company, Ltd., 85 High St., Ware, Herts.
D. P. Hickinbotham, East Sussex School of Agriculture, Plumpton, Sussex
Miss D. M. Hickson, 19, Nunsfield Drive, Alvaston, Derbyshire
Samuel Hodson, 20, Castle Grove, Holcombe Brook, Bury, Lancashire
Mrs. D. Holland, Upton Poultry Farm, Poole, Dorset
J. C. Holland, Upton Poultry Farm, Poole, Dorset
Edmund Holt, Oaklands Park Farm, Hurstpierpoint, Hassocks, Sussex
J. J. Holt, Quaker Oats, Ltd., Southall, Middlesex
C. Horton-Smith, Poultry Research Station, Animal Health Trust, Houghton-Grange, Houghton, Huntingdonshire
Douglas Hoskins, 1, West End Street, Somerset
M. D. How, Woodlands Farm, The Vale, Chesham, Buckinghamshire
J. A. Howard, 73, Harborough Road, Kibworth Harcourt, Leicestershire
R. T. Howlett, Willowhurst, Fordham, Ely, Cambridgeshire
D. L. Hughes, Boots Pure Drug Co. Ltd., Research Department, Veterinary Science Division, The Priory, Thurgarton, Nottinghamshire
H. Hulme, Great Bossington, Adisham, Canterbury, Kent
Rowland Hunt, Aswardby Hall, Nr. Spilsby, Lincolnshire
W. B. Hunt, "Poultry Farmer," 189, High Holborn, London, WC 1
William Ibbotson, Crofton Hall Poultry Farm, Crofton, Nr. Wakefield, Yorkshire
Miss A. Ironside, Ministry of Agr., No. 2 Government Bldgs., White Knights Road, Early, Reading, Berks.
D. M. Jack, Swalcliffe Lea, Banbury, Oxford
Miss R. Jackson, Abbotsfield, Sutton Road, Shrewsbury, Shropshire
L. P. Jenkinson, Hill Head Farm, Chumleigh, Devon
J. W. Jennings, The Poultry Farm, Garsington, Oxford
F. H. Jones, Berkeley Towers, Nantwich Road, Crewe, Cheshire
F. T. W. Jordan, Department of Veterinary Preventive Medicine, Field Station, Leahurst, Neston, Wirral, Cheshire
Miss K. Keelan, Melford Road, Sudbury, Suffolk
C. P. Keevil, 240, Central Markets, Smithfield, London, EC 1
J. Kemp, Yorkshire Egg Producers, Limited, Whitehall Road, Drighlington, Near Bradford, Yorkshire
G. A. Kent, 2, Matthews Lane, East Boldre, Brockenhurst, Hampshire
Ketchum Manufacturing Co., (F. C. Parsons), Walton-on-the-Hill, Tadworth, Surrey
Miss E. E. Kidd, 144 High Holborn, London, WC 1
H. S. King, Bryworth Lane Poultry Farm, Lechlade, Gloucestershire
J. W. Knowles, New House Farm Cottage, Great Abington, Cambridgeshire
T. E. Knowles, Ministry of Agriculture, Government Buildings, Cop Lane, Penwortham, Nr. Preston, Lancs.
S. K. Kon, Department of Nutrition, National Institute for Research in Dairying, Shinfield, Nr. Reading, Berkshire
Miss M. E. Lambert, Brooksby Hall Farm Institute, Brooksby nr. Melton Mowbray, Leicestershire
F. M. Lancaster, Griffin St., Broughton-in-Furness, Lancashire

Miss B. Lang, National Agricultural Advisory Service, Shardlow Hall, Shardlow, Derbyshire
Peter Langmead, Wick's Farm, Yapton, Arundel, Sussex (Life Member)
Miss M. V. Larkworthy, Cooper's Bridge, Bramshott, Nr. Liphook, Hampshire
Miss D. M. Lawrence, 8, Guy's Cliffe Avenue, Leamington Spa, Warwicks
K. Leaf & Co., Limited, 314, Radford Road, Nottingham
Lt. Cdr. Pierre Le Du, R.N., Spring Cottage, Little Bentley, Nr. Colchester, Essex
J. S. Lintern, Hoppers Farm, Great Kingshill, Buckinghamshire
W. J. Linton, Crolin, Tasley Bank, Bridgnorth, Shropshire
Miss J. Lockwood, Little Trees, Brandesburton, Driffield, Yorks
E. B. Lomax, (R. Silcock & Sons, Ltd.), Edmund Street, Liverpool 3
Miss K. L. Luing, West Bank House, Skipton-in-Craven, Yorkshire
Major Ian Macdougall, 45, Bedford Square, London, WC 1
Mrs. M. J. Mackenzie, Challands Farm, Halam, Newark, Nottinghamshire (Life Member)
R. H. Macnab, % A. J. White Ltd., 119 Coldharbour Lane, London, SE 5
Miss N. B. Maddison, Brookside, Dane Hill, Sussex
M. Mahaffey, % E| F. Fairbairn, Ltd., Caldewgate, Carlisle, Cumberland
H. H. Mann, Woburn Experimental Station, Husborne Crawley, Bletchley, Bucks.
T. Barton Mann, "Braust," Weyhill, Nr. Andover, Hampshire
W. Marshall, Incubation Research Laboratory, Papworth Industries, Papworth Everard, Cambridgeshire
Edward Marston, Leicestershire Farm Institute, Brooksby Hall, Nr. Melton Mowbray, Leicestershire
Miss M. M. Martin, British Oil and Cake Mills, Ltd., 2 Kingscote St., London, EC 4
J. Martland, Blithe House, Cottage Lane, Ormskirk, Lancashire
Miss Jean C. Mason, 11 Lindisfarne Road, Alnwick, Northumberland
C. G. May, 17, West Side, Watford Way, Hendon, London, NW 4
S. A. Maycock, Tower House, Southampton Street, London, WC 2
W. M. McKay, % Spillers, Ltd., 40, St. Mary Axe, London, EC 3
W. W. McKinney, Harper Adams Agr. College, Newport, Shropshire
David McMaster, Mount Bures Hall, Bures, Essex
Major A. M. Melville, The Bury Farm, Chesham, Buckinghamshire
R. H. Mendham, Kyrewood House, Tenbury Wells, Worcestershire
A. T. Mennie, Lederle Laboratories, Bush House, Aldwych, London, WC 2
Maurice Millard, Peipards Farm, Freshford, Bath, Somerset
Miss V. C. Milner, County Education Office, "Larkbeare," Topsham Road, Exeter, Devon
A. C. Moore, The Laurels, Gorse Lane, Anstey, Leicestershire
Mrs. Ada Moore, Thurlaston Lodge, Leicester Forest West, Desford, Leicestershire
Willard Moore, National Inst. of Poultry Husb., Newport, Shropshire
M. C. Morgan, National Agricultural Advisory Service, Government Buildings, Alphington Rd., Exeter
E. G. Morris, Ministry of Agriculture, Animal Health Division, 45, Southgate Street, Winchester, Hampshire
J. B. Morrison, Eastcliffe Promenade, Whitley Bay, Northumberland
Miss Kathleen Muir, Papworth Poultry Farm, The Knoll, Papworth Everard, Cambridgeshire
W. R. Muir, J. Bibby & Sons, Limited, Weatherstones, Windle Hill, Neston, Wirral, Cheshire

William Naish, Poultry Sales Department, British Oil & Cake Mills, Ltd., Bathurst Wharf, Bristol
P. A. S. Newbold, 21, South Road, Abington, Cambridge
Miss M. S. Newbury, Shropshire Farm Institute, Walford Manor, Baschurch, Shrewsbury, Shropshire
V. F. Newman, Sterling Poultry Products, Limited, Martin Hall, Fernhill Heath, Worcestershire
Miss M. Norden, 16 Clarendon St., Bedford
G. R. H. Nugent, Blacknest Farm, Dunsfold, Nr. Godalming, Surrey
D. J. Oatley, Paxcroft Farm, Hilperton, Trowbridge, Wiltshire
J. L. E. Ogier, Rough Hill (Farms) Ltd., East Hanningfield, Chelmsford, Essex
L. L. Ogier, Rough Hill, East Hanningfield, Chelmsford, Essex
Frank Oldham, Rosemoor Poultry Farm, Stock Road, Billericay, Essex
B. de H. Pickard, West Wantley Farm, Storrington, Sussex
G. J. Pickering, Lackham School of Agriculture, Lacock, Near Chippenham, Wiltshire
D. J. Protheroe, County Institute of Agriculture, Hutton, Preston, Lancs.
John Rannoch, Ltd., Elmswell, Nr. Bury St. Edmonds, Suffolk
Reeden Poultry Co., Ltd., Dalton, Thirsk, Yorks.
I. W. Rhys, Ministry of Agriculture, Shardlow Hall, Shardlow, Derbyshire
C. T. Riley, Twyford Lodge Cottage, Twyford, Nr. Winchester, Hampshire
Miss Enid M. Roberts, 7, Elmwood, Welwyn Garden City, Hertfordshire
Mrs. G. H. Robinson, Hart Farm, Stevington, Bedfordshire
L. Robinson, 30 Guildford Road, Horsham, Sussex
J. Rossall, Goose Hall, Cow Hill, Grimsargh, Preston, Lancashire
Salter & Stokes, Limited, Diploma House, High Road, East Finchley, London, N 2
Sappa, Limited, Bury St. Edmunds, Suffolk
Gerald Scott, Little Bursteads Farm, Little Hallingbury, Bishops Stortford, Hertfordshire
John Scott, The Midlands Accredited Stations Hatchery, Ltd., Broome, Near Stourbridge, Worcestershire
J. A. Senior, Sowood Poultry Farm, Nafferton, Driffield, Yorkshire
Fred Sharp, Hoyle House Farm, Oakworth, Keighley, Yorkshire
R. Burt Shaw, University of Nottingham School of Agriculture, Sutton Bonington, Loughborough, Leicestershire
Mrs. R. B. Shaw, Kenmore, College Road, Sutton Bonington, Loughborough, Leics.
J. J. Shemtob, Harper Adams Agricultural College, Newport, Shropshire
Frank Siddall, The Manor, Cantley, Norwich, Norfolk
W. H. Silk, Courts Wynde, Haslemere, Surrey
Mrs. M. K. Smith, Monkton Court Farm, Minister-in-Thanet, Kent
T. A. Smith, Estate Office, Woodhall Park, Hertford, Herts.
M. B. Smithson, 15, Woodlands Park, N. Gosforth, Northumberland
J. Spencely, Lymm Poultry Farm, Limited, Higher Lane, Lymm, Cheshire
A. E. Spink, Prospect Farm, Easingweld, Yorkshire
R. W. Spriggs, Fairfield Farm, Clapham, Bedfordshire
C. G. Stacey, The Dory House, Houghton Grange, Huntingdonshire
Ben Stansfield, Square Works, Mytholmroyd, Halifax, Yorkshire
Major O. R. Stevenson, Ministry of Agriculture, 203, High Street, Lewes, Sussex
Mrs. O. R. Stevenson, Ministry of Agriculture, 203, High Street, Lewes, Sussex
Steward, C. Calver, "Strathdene," Willaston, Wirral, Cheshire
Miss M. Strain, Pool Cottage, Saifton, Ludlow
Miss J. W. Strang, Institute of Agriculture, Moulton, Northamptonshire

Harry Strike, 37, Guildhall Street, Preston, Lancashire
L. W. Sugg, Harewood Farm, Andover Down, Andover, Hampshire
D. G. Sutcliffe, Fairfield, Hebden Bridge, Yorkshire
H. Sutcliffe, The Egg Packing Station, Cliviger, Nr. Burnley, Lancashire
A. Sutherland, Rock Poultry Farms, Ltd., Alnwick, Northumberland
Jim Sutton, Clifton Pedigree Poultry Farm, Longton, Preston, Lancs.
G. R. L. Sykes, Queen Manor Farm, Laverstock, Salisbury, Wiltshire
H. L. Tabor, Limited, 28-30, Leandenhall Market, London EC 3
J. A. B. Tabor, 28-30, Leadenhall Market, London, EC 3
Harry Taylor, Throstle Nest Poultry Farm, Mytholmroyd, Yorkshire
M. W. Taylor, National Agr. Adv. Service, "Woodthorne," Wolverhampton
Miss C. G. Taylor, Little Oxford, Cadmore End, Nr. High Wycombe, Bucks.
H. A. Temperton, National Institute of Poultry Husbandry, Newport, Shropshire
C. Tetlaw, 17 Duke St., Elland, Yorkshire
Alan Thompson, Biss Farm, Upton Scudamore, Nr. Warminster, Wiltshire
Cyril Thornber, Square Works, Mytholmroyd, Halifax, Yorkshire
J. Thornhill, The Poultry Farm, Great Longstone, Derbyshire
Stanley Trevaskis, Penhale Jakes, Ashton, Helston, Cornwall
Stanley Turnbull, Nares Gladley Farm, Leighton Buzzard, Bedfordshire
J. G. Turner, "Springfield," Langley, Maidstone, Kent
L. C. Turnill, Ministry of Agriculture, Pivington House, Lenham, Kent
F. Tyrrell, 10, Kylemore Avenue, Bolton, Lancashire
A. S. Vellacott, East Clayton Farm, Washington, Sussex
A. G. Voss, Wilsford Heath Farm, Ancaster, Grantham, Lincolnshire (Life Member)
F. R. Walbutton, 15, Queenswood Road, Durleigh, Bridgwater, Somerset
C. S. Walden, Holden, Chipperfield Road, King's Langley, Hertfordshire
A. L. Walther, % Crosfields & Calthrop, Limited, Vauxhall Road, Liverpool 5
A. G. Warren, Ministry of Agriculture, Staplake Mount, Starcross, Exeter, Devon
Y. Watanabe, Suma Poultry Farm, Hatchford, Cobham, Surrey
Miss A. F. Watt, Government Buildings, Chalfont Drive, Western Boulevard, Nottingham
W. J. Welford, Ashley House, Clifton, Deddington, Oxford
Robert Welsh, National Inst. of Poultry Husb., Newport, Shropshire
W. F. Werrett, Hans Hall Farm, Willaston, Wirral, Cheshire
L. G. Western, Western Incubators, Ltd., East Hanningfield, Chelmsford, Essex
Miss M. E. Whipp, 148, Dalston Road, Carlisle, Cumberland
B. N. Wilcock, Ministry of Agriculture, Block C, Government Bldgs., Redhill, Worcester
J. F. Willerton, Ministry of Agriculture, St. Mary's Manor, Beverley, Yorkshire
C. Y. Williams, The Branchet, Kelsall, Chester
Mrs. Helen Williams, The Bodilly Poultry Farm, Heston, Cornwall
J. G. Williams, The Bodilly Poultry Farm, Heston, Cornwall
V. J. Williams, National Agricultural Advisory Service, Herts. A.E. Committee, Brickendonbury, Hertfordshire
E. Williamson, Randlawfoot Farm, Wetheral, Carlisle, Cumberland

Keith Wilson, Land Settlement Association, 43, Cromwell Road, London, SW 7
A. N. Worden, Cromwell House, Huntingdon
Miss M. M. Wright, National Institute of Poultry Husbandry, Newport, Shropshire

FINLAND

Esko Alavuo, Hameenlinna, Hätilä
Hammaslääkäri Kaarlo Hellemaa, Mannerheimintie 38, Helsinki
Paul Olson, Taklax, Korsnas
Erkki Tiitola, Kaivanto
Ensio Toivanen, Siipikarijanoitokoulu, Hämeenlinna
H. Westermarck, St. Allen 1, Munksnas
N. Westermarck, St. Allen 1, Munksnas

FRANCE

Mlle. Bonnet, Ecole Nationale d'Enseignement, Menager Agricole de Coetlogon, Rennes (I. & V.)
J. Peruchon de Brochard, 52 Rue Longue-des-Capucins, Marsaille (B.-du.-Rh.)
Yves Cauquelin, a Montgaillard (Landes)
M. L. Cochez, Docteur Veterinaire, Eysines (Gironde)
S. A. Duquesne, a Montford s'Risle, (Eure)
Etabliss, Provimi, 55 Rue Favreuil, Croix (Nord)
Mrs. Ed. Flamencourt, Exploitation avicole du Petit Aunay a Meung, S. et L. (Loiret)
Emile Hualt, Elevage du Vexin, Villers en Vexin (Eure)
H. Jacotot, Institut Pasteur, 25 rue du Dr. Roux, Paris XVene
Prof. Lesbouyries, Ecole Veterinaire, d'Alfort (Seine)
Dr. G. Lissot, a Pacy s/Eure, (Eure)
Louis Passebon, "les Mazeraies", Savonnieres (Indre & Loire)
M. R. Pero, Director, Station de Recherches Avicoles, Domaine de Vilvert, Jouy-en-Josas (Seine et Oise)
Societe Technique D'Alimentation Rationnelle, Chateau-la-Valliere (Indre & Loire)
Dr. J. Thiery, 4 Bis. Rue Michel Chasles, Paris 12th
Maurice Tobler, a Dancourt par Nogent le Roi. (E. & L.)
P. Waroquiez, 12, Rue d'Armaille, Paris XVII
Alex Wiltzer, 28 Rue Bonaparte, Paris 6

FRENCH CAMEROON

Dr. J. Vachette, Service d'Elevage, Yaounde

GERMANY

Fritz Alberti, Mars-la-Tour-Str. 2, Oldenburg i.O.
Arnold Becker, Im Rosenkamp 6, Mülheim-Ruhr
L. R. Becker, Engelstr. 50, Münster/Westf.
Julius Beyer, Hofgut Fremersberg, Baden-Baden
Rolf Bölts, Westerscheps bei Edewecht i. Oldenburg
Wilhelm Bremer, München, Lerchenfeldstr. 28
Dr. von Burgsdorff, Garath bei Düsseldorf-Benrath
A. G. Chinosolfabrik, Hamburg 48, Billbrookdeich 42
Paul Collignon, Bonn a. Rhein, Sandstr. 43a
Reg. Rat Cretschmar, Dörnbergstr. 25/27, Celle
Marga Dieckmann, Eutin/Host, Fissau-Bruck 1
Karl Ehlers, Volsemenhusen bei Marne i. Dithmarschen
J. Eickel, Hamm i. Westfalen, Saarlandstr. 28
Reinhard, Fangauf, Kiel-Wik, Steenbeker Weg 151
K. W. Fangauf, Warburgstr. 35, Hamburg 36
Erich Fetzer, Geislingen-Steige bei Württ.
Hans Freyer, Bremen, Kirchbachstr. 97
K. Fritzsche, Blücherstr. 34, Koblenz
Otto Garlichs, Verband Deutscher Wirtschaftsgeflügelzüchter e.V., Bonn a. Rhein, Koblenzer Strasse 174
Geflügel-Börse, Westdeutsche Ausgabe, S. Jürgens-Verlag, München 13, Hohenzollernstr. 158
R. Gleichauf, Dörnberkstr. 25/27, Celle
Josef Griemens, Ankerstr. 16, Würselen b. Aachen

Peter Grüter, Düsseldorf, Rosstrasse 135
Bernhard Grzimek, Frankfurt a. Main, Friedberger Anlage 16
Heino Haas, Landwehr Über Overath/Rhld.
Reg. Amtmann Haneberg, München 15, Kaiser-Ludwig-Platz 5
Prof. Havermann, Bonn a. Rhein, Nussallee 5, Institut für Tierzucht und Tierfütterung
Gotthilf Heermann, Mühlacker/Württ., Ausserhalb 5
Albrecht Heise, Timmerhorn üb. Ahrensburg/Hamburg
Dr. Hohls, Dörnbergstr. 25/27, Celle
Carl Höveler, Immigrath/Rhld.
Else Hecker, Sigmaringen, Burgstrasse 1
Institut für Tierzucht und Milchwirtschaft der Universität Göttingen, Göttingen, Nikolausberger Weg 13
Dr. Kautz, Geflügelhof, "Alt-Württemberg," Ludwigsburg, Am Kugelberg
Gottfried Keppler, Pfullingen, Elisenweg 20
A. Koch, Celle, Dörnbergstr. 25-27, Bundesforschungsanstalt für Kleintierzucht
Prof. Krüger, Giessen, Oberer Hardthof
Anton Lang, Geflügelhof, Inning/am Ammersee
Heinrich Lauter, Eilendorf b. Aachen, Franzstra. 19
Günter Ling, Viersen/Rhld., Heimbachstr. 11
E. Mangold, Berlin-Friedenau, Laubacher Strasse 21
Dr. Mantel, Geflügelzuchtanstalt Erding/Obb., Schliessfach 30
Prof. Mehner, Instit für Tierzuchtlehre an der Landw. Hoch-Schule, Stuttgart-Hohenheim
Elisabeth Mielck, Geesthacht bei Hamburg, Hohenkamp 6
Fritz Pfenningstorff, Berlin-Lichterfelde 1, Herwarthstr. 3
Heinrich Mohrmann, Sülfeld üb. Gifhorn/Hann.
Fritz Möhlenpage, Lemförde
Frl. Lotte Mühlich, Stuttgart-S., Marienstra. 25
Lore Paret, Tübingen-Derendingen, Windfeldstr. 6
W. Rauch, Bundesforschungsanstalt für Kleinstierzucht, Celle, Dörnbergstr 25-27
Hans Reschke, Geflügelzuchtmeister, Peine, Peiner, Geflügelhof
Dr. Rienecker, Bundesministerium für Ernährung, Landwirtschaft und Forsten, Bonn-Duisdorf
R. Römer, (22b) Arzbach bei Bad Ems, Forststr 32a
Wilh. Salzwedel, Walldürn/Nordbaden, Obere Vorstadtstr. 10
Irmgard Sassenhoff, München 22, Veterinärstr. 6, Gesundheitsdienst für Kleintiere
Henrich Schäfer, VelmedenüMeissner, "Haus Meissnerblick"
Landw. Rat Hans Schlütter, Lehr- und Versuchsanstalt für Geflügel- und Kleintierzucht, Krefeld-Grosshüttenhof
Ernst Schulze-Buxloh, Osterbönen üb. Hamm/Westf.
E. Schürmann, Bonn a. Rhein, Katzenburgerweg 7-9
G. Schwenkenbecher, Hamm/Westf., Saarlandstr. 28
Hans Spiecker, Riedlingen/Donau
Fritz Steinhoff, Nutzgeflügelhalf, Hannover-Buchholz, Buchholzer Kirchweg 70
Josef Stucht, Bork i. Westf.
Dr. Stute, Celle, Dörnbergstr. 25/27
Dr. Wagener, Hygienisches Institut der Tierärztlichen Hochschule, Hannover, Misburger Damm 16
Rosemarie Wegner, Bonn, Bismarckstr. 14
Wilhelm Ziebertz, Duisburg-Hamborn, Kaiser-Friedrichstr. 249
Prof. Zorn, Landesanstalt für Tierzucht., Brub b. München
Heinz Zummbruch, Elberfeld, Am Lützenberg

GREECE

A. M. Syrigos, 8 Guilford St., Athens

HAWAII

Chas. M. Bice, University of Hawaii, Honolulu 14, T.H.
M. M. Rosenberg, Agric. Exper. Station, University of Hawaii, Honolulu

HOLLAND

H. Adams, Hotel de "Bosrand," Ugchelen
M. van Albada, Konigsweg 31, Beekbergen
A. J. van Amerongen, C. 189, Epe
V. van Asperen Vervenne, Hoofdstraat 29, De Steeg
G. J. W. Beestman, Jasmijnstraat 28, Almelo
L. de Blieck, Soestjkerstraatweg 113 N, Bilthoven
K. Bos, Jacob Catslaan 39, Amersfoort
O. Bosgra, % N. V. Philips-Roxane, Postbus 2, Weesp.
P. J. van de Bremer, Ons Doelstraat 24, Boxtel
E. ten Cate, Wierdensestraat 51, Almelo
A. Clarenburg, Sterrenbos 1, Hoofd v.d. Veterinaire Afd. van het Rijksinstituut v.d. Volksgebondheit, Utrecht
J. van der Deure, Edescheweg 83, Bennekom
H. R. Doppen, Kerkstraat 27, Gilze
Th. van Eek, N.V. Centrale Suiker Maat. Biochemische Industrie, Gorinchem.
H. M. K. Frings, Dorpstraat 105, Beekbergen
J. Grashuis, "De Schothorst," Hoogland
W. Groenevelt, Charlotte de bourbonlaan 38, Rotterdam
E. H. Groot, Chemische Fabriek "Noord Holland," Beverwijk
J. J. Hendrikse, Emmaweg 2, Maarsen
B. J. C. te Tennepe, Sportlaan 161, 's-Gravenhage
W. Hiddema, dierenarts, N.V. Oliefabrieken, Calve-Delft, Delft
W. K. Hirschfeld, Amersfoortsestraat 45, Soesterberg
L. Hoedemaker, De Savornin Lohmanlaan 493, 's-Gravenhage
J. Hoogendoorn, Geerdingsweg 169, Hengelo (O)
B. Hooghiemstra, Witte Vrouwensingel 105, Utrecht
W. ten Hoopen, Zutfenseweg 108, Lochem
A. Jansen, Kalkoinweg 16, Ermelo
H. G. Kok, Taalstraat 20, Vught
J. G. Konings, Oirschotlaan 25, Zeist
J. Kortenoever, Konigslaan 64, Utrecht
H. Koudijs, "De Cotelaar," Barneveld
W. Koudijs, Kooterweg 70, Barneveld
F. A. de Lange, Harderwijkerweg 142, Ermelo
M. Leverland, Arnhemseweg 598, Beekbergen
O. Meijer, % Farmer Graanproducted, A-weg 5, Groningen
J. S. Mulschlegel, Rembrandt v. Rijnstraat 94, Groningen
P. G. Methorst, Arnhemseweg 453, Beekbergen
E. E. Muytjens, Lab. N.V. Chem. Fabriek "Noord-Holland," Beverwijk
A. A. Oskam, Dierenarts, Stolwijk
G. M. van der Plank, Ouderwijkerlaan 37, Utrecht
S. J. Postma, Bildtsestraat 36B, Leeuwarden
R. Prakken, Bosweg 43, Wageningen
D. Rempt, Landbouwhuis, Directeur Gezondheidsdienst voor Dieren in Noord-Holland, Alkmaar
J. Richter, Spoorstraat 67, Boxmeer
D. C. de Ridder, Raamweg 25/27, 's-Gravenhage
W. J. Roepke, Amersfoortsestraat 47, Soesterberg
C. Romijn, Waterweg 32, De Bilt
K. A. A. Rouwenhorst, Prins Alexanderweg 58, Huis ter Heide
J. J. Ruys, Berg en Dalweg 1, Beekbergen
W. H. Schimmel, Amersfoortsestraat 35, Barneveld
H. H. Scholten, Verspronkweg 3, Haarlem
P. Sluis, Pluimvee-en-Vogel, Voederfabriek, N.V., Weesperkarspel
W. H. Smits, J. W. Frisostraat 6, Utrecht
W. Stehouwer, p/a N.V. Organon, Oss
G. D. Stheenis, Regentesselaan 45, Bussum
J. G. Tukker, Utrechtseweg 298, De Bilt
P. Ubbels, Spelderholt 9, Beekbergen
P. G. Vaags, Landstraat 45, Aalten
C. S. th. Van Gink, Joh. Vermeerstraat 3, Heemstede.
M. J. Verkuil, Bloemendaallaan 15, Barneveld
J. van der Vliet, % N.V. Philips-Roxane, Postbus 2, Weesp

G. de Vries, Jac. v/d Borchstraat 48, Utrecht
G. M. van Wavernen, Poelslaan 35, Rotterdam
D. J. Wiltink, Willemstraat 11, Doetinchem
P. J. Wijk Pzn, Haersma de Withlaan 9, Apeldoorn
B. H. v.d. Zanden, van Ruysdaellaan 11, Leidschendam
H. van der Zee, p/a N.V. Organon, Oss
F. A. De Zeeuw, Soestdijkersweg 91, De Bilt
D. M. Zuydam, Dordtsestraatweg 981, Rotterdam
N. Zwiep, N.V. Philips-Roxanne, Weesp

INDIA

S. G. Iyer, Officer in Charge, Poultry Research Section, I.V.R.I., Izatnagar, U.P.
C. M. Jasawalla, Fair Fields Farm 14, Salisbury Park, Poona (Life Member)
Mrs. M. N. Roy, The Roy's Pedigree Poultry Farm, P.O. Natra 24-Pargs., West Bengal

ISRAEL

Z. Ben-Adam, Govt. Poultry Exp. Station, Ako
J. Berkman, Schunat Rassco, Ramat-Hasharon
S. Bornstein, 8 Hapardes St., Tel-Aviv, Israel
R. Goldstein, P.O. Box 3, Binhamina, Israel
A. Komorov, 20, Hamargoa St., Haifa
A. Livshitz, P.O. Box 10, Tel-Aviv
Poultry Breeders Assoc., P.O. Box 265, Tel-Aviv
J. H. Scheftelowitz, P.O. Box 46, Tel-Aviv
A. Thomin, POB 7, Kfar, Shmaryahu
David Uri, Min. of Agr., P.O. Box 11, Hakirja
E. Yizchaki, Bet Itzhag, Near Nathanya

ITALY

Francesco Babini, Russi, Ravenna
Giancarlo Bordoni, Centro Avicolo, Via S. Giacomo 9, Bologna
Aurelio Carrante, Ministero per l'Agricoltura e le Foreste, Roma
Federico Clementi, Via Flaminia 43, Rome
Hector De Smaele, Casciago-Morosolo, Prov. Varese
H. Engler, F.A.O. Agriculture Division, Viale delle Terme di Caracalla, Rome
C. Faravelli, Azienda Agricola di Soriasco, S. Maria Della Versa, Prov. Pavia, Italy
Ferdinando Garagnani, Assoc. Avicunicola Nazion, Via Tegatto 1, Bologna
Allesandro Ghigi, Centro Avicolo di Bologna, Via San Giacoma 9, Bologna (Honorary Life Member)
Ida Giavarini, Instituto di Zooculture, Universita, Bologna
Renzo Giuliani, Ist. di Zootecnia, Universita, Firenze
Comm. Gaetano Montefusco, Via Livorno 36, Rome
Raffaele Mazzoni, Ministero Agricoltura e Foreste, Rome
Raffaello Quilici, Ministero Agricoltura e Foreste, Rome
Alulah Taibel, Staz., Sperimentale di Pollicultura, Rovigo
Nicola Tortorelli, Ovile Nazionale, Foggia
Vittorino Vezzani, Instituto Zootecnico e Caseario per il Piemonte, Torino
Carlo Zarotti, Via Calimala 2, Firenze

JAPAN

Suda Akira, 1228 1-chome Owada-cho, Hachioji-shi, Tokyo
Kokichi Deguchi, Okasaki Livestock Breeding Station, Iga-cho, Okazaki City, Aichi Pref.
Hasimoto Dyuro, 90 Kuri Nakada-mati, Sendai
Tadashi Hatano, Fac. of Agriculture, Tohoku University, Sendai
Bumpei Hayashi, Exp. Farm of Agr. Coll., Hokkaido University, Hokkaido
Kaneo Hibino, 623 Marunouchi Bldg., Tokyo
Tatsuo Hosoda, Nat. Inst. Agr. Sci., Chiba-shi, Japan
Sayoku Iida, No. 6, 1-chome Kanda Surugadai, Chiyoda-ku, Tokyo
Shunichiro Ito, % Omiya Poultry Breeding Sta., Omiya City

Masao Kamio, Livestock Production Sec., Livestock Bur. Min. Agr. & Forestry, Tokyo
Jirohiko Kondo, 75 Gochome, Asagaya, Suginami-ku, Tokyo (Life Member)
Kampachiro Kudo, No. 18, Iga-cho, Okazaki-City, Aichi-Prefecture
Kivoshi Masui, Meguroku Komabamachi 764, Tokyo
Hajime Mimura, Dept. of Agriculture, Miyazaki University, Miyazaki
Chikao Momose, No. 2111, 3-chome, Horinouchi, Omiya-shi, Saitama-Ken
Hiroshi Morimoto, Nat. Inst. of Agric. Sci., Chiba-shi
Motoo Naito, Lab. Animal Breeding, Bunkyo-ku, Tokyo University
Shusako Nishida, Fac. of Agric., Tohoku University, Sendai
Hyo Oana, No. 1356, 1-chome, Ikebukuro, Toshima-ku, Tokyo
Nobuhiko Onishi, Livestock Section, Inst. of Agr. Sciences, Chiba City
Iwaya Ryuichiro, 62, Tomizawa-cho, Sendai-shi, Miyagi-ken
Kiyotsuna Sasaki, Animal Breeding Lab., Fac. of Agric., Tokyo
Okazaki Shigeki, Higashishiraishi, Yamaguchi-shi, Yamaguchi-ken
Fumio Sugimoto, Okazaki Livestock Breed. Sta., Iga-cho, Okazaki City, Aichi Pref.
Mitsui Takanaru, 35, Suido-cho Bunkyo-ku, Tokyo
Morio Takano, Nishigoshi-mura, Kikuchi-gun, Kumamoto-ken
Masaharu Tange, 564 Terukuni-machi, Fukuoka
Masaharu Tauchi, Hyogo Syuchiku Bokujo, Itusaicho, Tatsunoshi, Hyogoken
Kiyoshi Yamanaka, 623 Marunouchi Bldg., Tokyo
Shoji Uesaka, Agricul. Dept., Kyoto University, Kyoto
Yukia Yamada, Agricultural Dept., Saga University, Saga City
Tokuzo Yamaguchi, 125 Wakabayashi-cho, Setagaya-ku, Tokyo
Yoshimaro Yamashina, 49 Nampeidai, Shibuyaku, Tokyo
Yoshichiro Yoneno, Kamikanuki, Numazu-shi, Shiquoka-ken
Shozo Yoshioka, % Livestock Production Sec., Livestock Bur. Min. Agr. & Forestry, Tokyo

LIBYA

M. K. Saca, LATAS, Agric. Programme, American Legation, Tripoli

LUXEMBOURG

Arthur Feller, Dudelange

MALTA

A. Azzopardi, 191 Ridolfo St., Sliema
Joseph Cesareo, 184 Pieta Wharf, Pieta

MEXICO

Gustavo Focke, Apartado postal 31931, Coyoacan, D.F.
D. Guardiola Castro, "Granja Veracruz", Galle Privada Granja Soledad, Calzaka Axcapotz, LaVilla, Mexico

NEW ZEALAND

A. H. Button, P.O. 25, Lincoln
E. Chambers, Wattledene, 122 Carmen Rd. Hornby, Christchurch
J. H. Kissling, % The Library, Massey Agr. College, Palmerston North
Stanley D. List, Secretary, New Zealand Poultry Board, P.O. Box 379, Wellington
K. C. H. Nogat, Grey Ave., Papatoetoe, Auckland
Miss M. W. Stewart, P.O. Box 109, Tauranga
Supt. of Poultry Industry, Dept. of Agric., Wellington

NIGERIA

D. H. Hill, Faculty of Agriculture, University College, Ibadan
D. Moorhouse, Agricultural Dept., Riyom, P.O. Voni, Plateau Province

NORTHERN IRELAND

Agr. Research Inst., (R. W. Hale, Sec.), Hillsborough
John Algie, Ministry of Agriculture, Stormont, Belfast
Fred R. Best, Lurga Boxmaking Co. Ltd., Boxmore Lodge, Lurgan
Miss A. E. Boyd, Ministry of Agriculture, Stormont, Belfast
R. G. Calvert, The Poultry Farm, Ballywalter
Miss M. H. Davidson, Poultry Advisory Officer, Dublin Road, Omagh, County Tyrone
Miss R. E. Dick, The Square, Antrim
Miss A. G. English, 6, Vicars Hill, Armagh
Mrs. D. C. Gamble, Holmvilla, Castlederg, Co. Tyrone
T. J. Kennedy, Millisle, County Down
David Luke, The Farm, Stormont, Belfast
Mrs. E. Nelson, Lismoyle, Fivemiletown, Co. Tyrone
J. G. Rhynehart, Ministry of Agriculture, Stormont, Belfast
Miss M. J. Sheedy, Ministry of Agriculture, Stormont, Belfast
R. F. Thompson, 76, Victoria Gardens, Belfast
Miss R. G. Walker, The Brook, Enniskillen, Co. Fermanagh

NORWAY

T. Anda, Sandnes
G. J. Christensen, Hansteensgt 12, Oslo
Leif Elstad, Seterstoa
Kr. Grepstad, Skien
Paul Grude, Kleppe
Ivar Haraldseid, Vang 1, p., Hamar
Johs Hoie, Norwegian H.S. for Agriculture, Vollebekk
John Holland, Slagen, Tonsberg
Emil Jessen, Hvalstad
Jonas Jonassen, Mossigre, Byrne
Arnbjorn Laerdal, Avaldsnesgt 100, Stavanger
Bjarne Moy, Spedalen
Harold Myhre, Indlaget, Slagen pr Tonsberg
F. Rostrup, Sola
Kr. Soreide, Chr. Krokhsgt 30, Oslo
Leif Svendsen, Norsk Fjorfeavlslag, Tollbugaten 12, Oslo
Sverre Thingulstad, As
Olaf Troeng, Vang 1.p., Hamar

PAKISTAN

Ishtiague Ahmad, % Essa Jaffar Co., Victoria Road, Karachi
Ahmed Abdul Aziz, Wolcot Industries, 166 Hyderabad Colony, Karachi
Nurul Islam, 49, Intelligence School, Queens Road, Karachi
E. Jaffar, % Essa Jaffar Co., Victoria Road, Karachi
Ashfaque Ahmad Khan, % Royal Dutch Airlines, Karachi
E. Manekjee, 20 Parsi Colony, Karachi (Life Member)
Haji Dawood Nasir, % Haji Dawood & Co., Bunder Road, Karachi
M. Naswaranjee, 20 Parsi Colony, Karachi (Life Member)
M. Qutubuddin, Central Gov't. Poultry Farm, Landhi, Karachi
Shah Rahman, Police Surgeon, Police Hospital, Karachi
M. M. Sadig, Pindi Gheb. Dist. Attock, Punjab, West Pakistan
Mohammad Usman, 30 Sind Market, Karachi

PERU

Horst Karlick, P.O. Box 1878, Lima

PHILIPPINE ISLANDS

F. M. Fronda, Dept. of Poultry Husbandry, Univ. of Philippines, Laguna
Julian Lou, 421 Azcarraga St., Manila

PORTO RICO

Alfonso Aguero Farm, Box 52, Aguar Buenas

REPUBLICA DOMINICANA

J. Pulgar, Instituto Politecnico "Loyola," San Cristobal, P.T.

SCOTLAND

Miss E. S. P. Adam, Agricultural College Office, Chambers Institute, Peebles
Miss C. W. Aikman, West Morriston, Earlston, Berwickshire
Miss E. J. Anderson, Department of Agriculture for Scotland, 41½ Union Street, Aberdeen
William Auld, Southfield Poultry Farm, Mauchline, Ayrshire
William Bolton, Poultry Research Centre, King's Building, West Mains Road, Edinburgh 9
Miss M. C. Cameron, % The British Oil & Cake Mills, Limited, 211 Union Street, Aberdeen
J. H. Carmichael, Thomas Howden, Limited, Graigentinny Avenue North, Leith, Edinburgh 6
K. J. Carpenter, Rowett Research Institute, Bucksburn, Aberdeenshire
Peter Cartwright, British Oil & Cake Mills, Lt., Seafield, Leith
Mrs. Moira S. Cobb, N. of Scotland Coll. of Agr., Deanery Bldgs., Dornoch, Sutherland
A. C. Coutts, Berstane Lane, St. Ola
Miss E. I. Coutts, Rose Villa, Alford, Aberdeenshire
Mrs. C. H. M. Cowan, The Blair, Fintray, Dyce, Aberdeenshire
Mrs. E. Dalziel, Courthill, Auldgirth, Dunfriesshire
Miss M. H. Deans, Department of Agriculture for Scotland, 41½ Union St., Aberdeen
John Duckworth, Rowett Research Institute, Bucksburn, Aberdeenshire
Miss E. M. W. Duff, Department of Agriculture for Scotland, Gov't. Bldg., Longman Road, Inverness
Miss C. M. Dunn, Agricultural College Office, 41½ Union Street, Aberdeen
Albert Edmondson, The British Oil & Cake Mills, Limited, 19 Blythswood Square, Glasgow, C 2
T. Elliot, Lochend Poultry Farm, Newbridge, Midlothian
W. J. Gill, James Gill & Sons, Ltd., 6 Exchange St., Aberdeen, Scotland
John Getty, The North of Scotland College of Agriculture, 41½ Union Street, Aberdeen
A. W. Greenwood, Poultry Research Centre, King's Buildings, West Mains Road, Edinburgh 9
J. C. D. Hutchinson, Poultry Research Centre, King's Buildings, West Mains Road, Edinburgh 9
Miss E. L. Ireland, 4, Albert Street, Arbreath
Stanley Kaye, Headinch Farm, Dinnet, Aberdeenshire
Miss Susan Kirk, West of Scotland Agricultural College, Auchincruive, Ayr.
Miss M. D. Langlands, 3, Union Street, Inverness
Miss G. Lewis, Edinburgh & East of Scotland College of Agriculture, Old Academy Buildings, Rose Terrace, Perth
Mrs. A. G. Maxwell, Golfhill, Moffat, Dumfriesshire
Miss M. M. MacLeod, Department of Agriculture for Scotland, Broomhouse Drive, Saughton
Miss Mona M. McLean, 5, Duke Street, Edinburgh 1
Mrs. M. A. B. Melville, Balmullo House, Leuchers, Fife
Miss M. S. Miller, Department of Agriculture for Scotland, 41½ Union Street, Aberdeen
W. S. Miller, Poultry Research Centre, King's Buildings, West Mains Road, Edinburgh 9
Miss E. M. Mills, Scottish Agricultural Industries, Limited, 199, High Street, Ayr.
Major T. Milne, Kellas Poultry Farm, Kingennie, by Broughty Ferry
Miss D. J. Peace, Poultry Research Centre, King's Buildings, West Mains Road, Edinburgh 9
Miss E. Y. Steven, North of Scotland Col. of Agr., 5 High St., Dingwall, Ross-shire
A. H. Sykes, Poultry Research Centre, King's Buildings, West Mains Road, Edinburgh 9

Sir Edward Villiers, Easter Hatchery, Conon Bridge, Ross-shire
R. Chalmers Watson, Fenton Barns, Drem, East Lothian
David M. Weir, 7/9 Arthur Street, Leith, Edinburgh 6
Donald S. Weir, 7/9 Arthur Street, Leith, Edinburgh 6
T. E. Whittle, West of Scotland Agricultural College, Auchincruive, Ayr.
J. E. Wilson, Ministry of Agriculture Poultry Laboratory, Lasswade, Midlothian
Miss M. B. F. Wilson, British Oil & Cake Mills, Limited, Seafield, Leith.
D. P. Wright, Bass Rock Poultry Farm, North Berwick, East Lothian

SOUTH AFRICA

J. W. Allen, P.O. Box 138, Johannesburg
A. J. Benning, Div. of Economics & Markets, P.O. Box 460, Cape Town
J. J. Blignaut, % The High Veld's Reg. Office, P/B Potschefstroom, Transvaal
W. F. Brunner, P.O. Box 177, Springs, Transvaal
T. Carryer, 74 Villiers Rd., Walmer, Port Elizabeth, Cape Province
G. P. Coetzee, 35 Ravenswood, Boksburg North, Transvaal
J. D. W. A. Coles, Div. of Vet. Ser., Onderstepoort, Pretoria
A. Dale, P.O. Thornhill, Cape Province
H. L. Davies, P.O. Box 42, Magaliesberg, Transvaal
Vallis, Pretoria
T. A. de Beer, Coll. of Agric., Glen, Orange Free State
B. de Gersigny, P.O. Box 48, Hillcrest
P. H. C. du Plessis, Division of Animal Husb. Dept. of Agr., P.O. Vallis, Pretoria
S. Ebedes, Zwartkop Poultry Farm, P.O. Box 529, Pretoria
H. P. Eloff, Natal Agr. Res. Inst., P.O. Oribi Camp, Pietermaritzburg, Natal
B. H. Field, Dalroyd Poultry Farm, P.O. Seven Oaks, Natal
L. M. Finlayson, P.O. Box 2233, Capetown
L. France, Don Rock Poultry Farm, P.O. Seven Oaks, Natal
Mrs. Kelly Freeborn, P.O. Box 9, Lynnwood via Pretoria
Miss M. L. Gaughan, Boschetto Agr. College, P.O. Box 56, Harrismith, Orange Free State
L. W. C. Gaymans, 90, Linbro Park, P.O. Edenvale, Transvaal
A. M. M. Gericke, Agric. Research Institute, The University, Pretoria
J. J. Grobler, P.O. Box 205, Standerton, Transvaal
C. H. Haagner, P.O. Box 115, Potchefstroom, Transvaal
W. J. Ham, Box 170, Boksburg, Transvaal
E. J. Haskell, 1, Winkley Street, Berea, East London, Cape Province
George Hibbert, Athlone Farm, P.O. Box 41, Berglvei, Transvaal
R. Heimann, Lismore Ave. off Tokai Rd., P.O. Retreat, Cape Province
David Jacobs, P.O. Box 10, Kroonstad, Orange Free State
W. W. Johnson, Rockdale, Kei Road, Cape Province
M. H. Jones, P.O. Box 170, Steynsrust, Orange Free State
W. F. C. Johnson, Box 7015, Newton Park, Port Elizabeth
D. Kidney, P.O. Box 459, Springs, Natal
Mrs. R. J. Kuit, P.O. Box 25, Lydenburg, Transvaal
R. C. Lamprecht, P.O. Box 486, Pretoria, Transvaal
Lello and Ingle, P.O. Botha's Hill, Natal
M. S. Letty, South African Poultry Assn., P.O. Box 1795, Johannesburg
T. Moseley, Holmfirth, Arundel Road, Rondebosch, Cape Province
F. E. O'Grady, P.O. Box 466, Johannesburg
A. W. Peters, P.O. Box 22, Cambridge, East London, Cape Province
Mrs. M. Phillips, Heathfield, Tarkastad, Cape Province
M. Raphael, P.O. Box 217, Cape Town
A. Robinson, 8 Robinson Place, Tollgate, Durban, Natal
L. Saunders, "Glen Berwyn," P.O. Tmyfelspoort, Transvaal
L. Segboer, P.O. Box 9, Bergvlei, nr. Johannesburg

P. J. Serfontein, 7, Noordbrug Road, Potchefstroom, Transvaal
N. W. Sheppard, The Willows, P.O. Silverton
J. H. Slabber, P.O. Box 40, Moorreesburg, Cape Province
H. T. Slatter, P.O. Box 1606, Durban, Natal
A J. R. Stevens, 34 Ben Alder Rd., The Hill, Johannesburg
J. R. Truter, P.O. Box 512, Vereeniging, Transvaal
Mrs. B. van Heerden, P.O. Box 529, Benoni, Transvaal
W. C. J. Viljoen, College of Agriculture, Glen, Orange Free State
S. J. D. Webb, % Ideal Cubes (Pty), Ltd., P.O. Box 205, Roodeport, Transvaal
A. Wessels, P.O. Box 598, Bloemfontein. Orange Free State
J. P. H. Wessels, College of Agriculture, Cedara, Natal
H. E. Wicks, P.O. Box 709, Port Shepstone, Natal
T. B. Wright, P.O. Box 20, Highlands, Cape Province

SPAIN

Thomas Allende, Jr., Castello 55, Madrid
F. Blanco, Guzman el Bueno 4, Madrid
M. C. Burguete, Granja-Hotel Depiedra, Las Rozas, Madrid
R. Calleja, (Spanish Embassy, Washington, D.C., U.S.A.)
J. C. Cano, General Mola 21, Zaragoza
Federico Castello, Real Escuela de Avicultura, Arenys de Mar
J. del Castillo, Explotacion Agricola Santa, Matilde, Apartado 5, Utrera (Seville)
R. Florido, Veterinario, Utrera
David Pino Francin, Avenida Colon, 1, Tortosa (Tarragona)
Francisco Lacasa Gayan, Apt. de Correos 21, Lerida
Francisco P. Jover, Paseo De Soto, num 12, Alicante
L. Latorre, Facultad de Veterinaria, Cordoba
Alfonso Montero, 12 de Octubre No. 8, Cordoba
J. G. Piedrafita, Veterinario Municipal, Especialifads en Avicultura, Carcastillo, Navarra
A. Romagosa, Av. Generalisimo 95, Tarragona

STRAITS-SETTLEMENT

E. B. Chase-Currier, 355a Joo Chiat Place, Singapore

SWEDEN

V. Adalberth, Skeppargatan 5, Kristianstad
Emil Ander, Harsback
Johan Andersson, Arnas, Askloster
J. Bondesson, Tingsryd
K. Borjesson, Seminariet, Rimforsa
I. Dawidson, Malma Stensvag 2, Uppsala 10
S. Eliaesson, Kungsgatan 67A, Agghandelsforbundet, Stockholm
B. Flygare, Svenska Agghandelsforb, Kungsgatan 67, Stockholm
Ivar Fors, Harald Fors & Co., Aktiebolag, Box 471, Stockholm C
G. Goude, Aggcentralen, Vaxio
C. E. Gunnar, Lycketorps Honseri, Mjolby
Einar Haeggblom, Karemo
Ivar Hansson, Bjorkenas Honseri, Kalmar
Harald Fors & Co., R.B., Box 471, Stockholm 1
A. H. Hofflander, Tyringe
E. Hultin, AB Ewos, Sodertalje
Axel Isaksson, Vasagatan 19, Djursholm
Olaf Jaegar, Nykvarn
Nils G. Jonsson, Hammenhogs Kontrollhonseri, Hammenhog
Holger Karlsson, Overby Kontrollhonseri, Uddevalla
Gunnar Larsson, Malsjo Honsgard, Ostra Malsjo
Sigfrid Larsson, Svalov
Birger Lindblad, Kragga Gard, Ekolsund
Stig Line, Lovasen, Skived
G. Okby, Box 4, Norrkoping
Edw. Olsson, Edo Honseri, Box 550, Upplands Vasby
Prof. Nils Olsson, The Agricultural University, Uppsala
Oscar Pettersson, Fredriksal, Box 18
Gustav Roos, Lillan
Y. Rosengren, Billeberga

Bengt Roslund, Hova
O. Sterner, Overlida
Svenska Kontrollanstalten for mejeriprodukter och ägg Göteborg
C. Tessman, Tess Farm, Svarvarbole
G. B. Thorden, Overby Gard, Lane-Harrestad
Sune Traskman, Sveriges fjaderfaavelsforening, Vasagatan 5, Stockholm
Vara Kontrollhonseri (F. Malmros), Vara
Fredrik Wehtje, Trolmens Egendom, Blomberg
A. Wennerberg, % A. B. Kontrollfoder, Gothenburg 2
Seved Werntoft, Werntofta Fjaderfaavelsstation, Klagstorp

SWITZERLAND

Max Abegg, Riethofstr. 23, Glattbrugg (Zurich)
Adolf Achermann, "Flora," Rothenburg/Lu
Emil Bachofen, Haslen Hinter Egg, Zurich
W. A. Bachofen, Dornacherstrasse 131, Basel
Willy Beeri, Parc Avicole, Epalignes s/Lausanne
Ernst Bolliger, Geflügelfarm, Bachli-Hemberg, St. G.
Leo Bolter, Geflügelfarm und Futterfabrik, Birkenau, Buchs, St. Gallen
B. Chappot, parc avicole, Sablile, Saxon (Valais)
Hans Dreyer, Werdtweg 5a, Bern
Ernst Duttlinger, Klaisberg, Neftenbach
Harald Ebbell, Ovomaltine Eierfarm, Oberwangen (bei Bern)
H. Engler (Rome, Italy)
G. Flory, 12, Vieux Clos, Conches (Geneve)
A. L. Geisendorf, % F. Hoffmann-LaRoche & Cie., Grenzacherstrasse, Basel
Hans Günthardt, Grüt, Adliswil, Zurich
K. Haag, Rathausstrasse, Weinfelden
E. Haefeli, Geflügelfarm Dickloo, Oberglatt (Zurich)
Paul Hagemann, St. Jakobsstrasse 191, Basel
E. Hess, Breitengerstrasse 27, Zurich 2
K. Hofer, Geflügelfarm, Egnach (Thurgau)
K. Huni, Arvenweg 8, Spiegel (Berne)
Institut für Haustierernährung, Eidgenossiche Technische Hochschule, Zurich
Joh. Kappeler-Gutknecht, Reservoirstrasse 205, Basel
A. Kiener, Sulgenrain 10, Bern
Karl Kleb, Kusnacht, Zurich
Mrs. K. Kunath-Schinkel, Katharinenhof, Aarau
Alfred Leutenegger, Geflügelfarm, Hobelwerkstrasse 11, Ober-Winterthur
J. Lieblich & Co., Eier en gros, Solothurnerstrasse 50, Basel
H. Loertscher, Institut für Tierzucht, Eidgenösische Technische Hochschule, Zurich
Arthur Lüchinger, Dornacherstrasse 34-36, Basel
P. H. Lutz, Geflügelhof Wattenbuhl, Oberrieden (Zurich)
E. Meisser, Schloss Binnigen, Binnigen (Baselland)
E. Mettler, SEG Bern, Konsumstrasse, Bern
E. Millioud, Les Riedes, St. Blaise, Neuchatel
Muhlen Aktiengesellschaft, Interlaken
Albert Naef, Gutsverwalter, Bocken ob Horgen, Zurich
J. Nicod, Le Couvent, Granges, Vaud
Dr. Per Rignes, % F. Hoffman-La-Roche & Co., A. G., Grenzacherstrasse 124, Basel
Peter von Salis, Kreuzlingen
E. Saxer, Weiherstrasse 10, Gumlingen (Bern)
G. Schmid, Veterinabakt. und Parasitologisches, Institut der Universität, Bern
C. Schnorf, Bergstrasse 4, Zurich 27, Postfach
H. Sequin, Les Vues, Coppet, Near Geneva
P. Siegenthaler, Muhlengenossenschaft, Spitalgasse 4, Bern
Robert Stahel, Geflügelzucht, Nieder-Uster (Zurich)
J. Ph. Stoeckli, Les Paquerettes, Sion
Max Sulser, SEG-Zurich, Glattsbrugg (Zurich)

P. Steinegger, Schweiz-Geflügelzuchtschule, Zollikofen, Bern
Werner Thomann, im Strick, Uetikon am See, Zurich
A. Walder, Waldeck, Walchwil am Zugersee
P. Willi, Muhle Debendorf A.G., Dubendorf (Zurich)
D. Wolf, Geflügelfarm, Volketswil-Zurich

THAILAND

Nai Son Brahamatep, The Agric. Sec., Town Hall, Lampoon Province, N. Thailand
Udom Kiewkingkeao, Poultry Promotion Assn., Phya Thai Rd., Bangkok
J. E. Lancaster, Department of Livestock Development, Phya Thai Road, Bangkok
Luang Suwan, College of Agriculture, Bangkhen, Bangkok
Nai Charoen Uneklabh, % B. Grimm & Company, P.O. Box 66, Bangkok
Luang Vaya Vudhi, 85 Soi Rang Nam, Phya Thai, Bangkok
Anek Yomchinda, Dept. of Livestock Development, Bangkok

TURKEY

K. Bilgemre, Animal Breed. Inst. Agric. College, Ankara
H. S. Oytun, Institute of Parasitology, Veterinary Faculty, Ankara

UNITED STATES OF AMERICA

O. J. Abbott, Poultry Dept., Univ. of Wisconsin, Madison, Wis.
R. E. Ahlin, Doughboy Industries, Inc., 215 North Main Ave., New Richmond, Wis.
J. Alexander, 994 McNear Ave., Petaluma, Calif.
L. S. Allen, Cumberland Dairy Prod. Inc., Fayetteville, N.C.
W. H. Allen, Sec. of Agriculture, 1 West State St., Trenton, N.J.
H. J. Almquist, The Grange Company, Modesto, Calif.
H. H. Alp, Director Pltry. Dept. American Farm Bureau Fed., 221 No. LaSalle, Chicago, Ill.
A. S. Anderson Hatchery & Breeding Farm, Rt. 2, Box 325, Rio Linda, Calif.
G. H. Arscott, Poultry Dept., Oregon State College, Corvallis, Ore.
V. S. Asmundson, Div. of Poultry Husbandry, University of California, Davis, Calif.
Harry Atkins, Box 756, Davenport, Iowa
J. M. Atkinson, Box 97, Nevada, Mo.
C. D. Ator, Div. of Agr. Oklahoma A & M Tech., Okmulgee, Okla.
T. B. Avery, Dept. of Poultry Husbandry, Kansas State College Manhattan, Kansas
M. C. Babcock, Babcock Poultry Farm Inc., RD 3, Ithaca, N.Y.
M. M. Bacharach, University of Wisconsin, Dept. of Poultry Husbandry, Madison, Wis.
E. A. Banellis, 444 Canyon Road, Logan, Utah
Luther Banta, 38 Fearing St., Amherst, Mass.
Walter Baumann, R.F.D. 2, Branford, Conn.
F. Z. Beanblossom, 310 Crescent Dr., Bryan, Texas
W. A. Berger, Shea Chemical Corp., 1201 St. Paul St., Baltimore, Md.
P. E. Bernier, Dept. of Poultry Husb., Oregon State College, Corvallis, Oregon
H. R. Bird, Poultry Dept., Univ. of Wisconsin, Madison, Wis.
Bittner's Springbrook Farms, Westmoreland Depot, New Hampshire
C. C. Blake, State Dept. of Agriculture, Charleston, West Va.
J. K. Bletner, Dept. Animal Husbandry, West Virginia University, Morgantown, W. Va.
H. E. Botsford, Jacksonville, N. Y.
R. V. Boucher, 303 Frear Lab., State College, Pa.
B. Braddock, Bryceville, Florida
M. M. Brender, Brender's Leghorns, Ferndale, N.Y.
E. Brenner, Box 4004, Atlanta, Ga.
C. S. Brewster, 2528 S.E. Harrison St., Portland, Ore.
G. M. Briggs, Poultry Nutrition Unit, National Institute of Health, Bethesda 14, Md.

A. R. Broman, P.O. Box 1141, Great Falls, Montana
Earl Brown, Route 1, Box 831, Ceres, California
Ambrose Brownell, Brownell Farms, Box 73, Milwaukie 2, Ore.
J. H. Bruckner, Rice Hall, Cornell University, Ithaca, N.Y.
O. Brunken, 440 W. Walnut St., Pasadena 3, Calif.
C. C. Brunson, Poultry Department, Louisiana State Univ., Baton Rouge 3, La.
D. J. Bryant, 266 Brisbane St., Monrovia, Calif.
P. Budesen, Petaluma Hatchery, 619 Main St., Petaluma, Calif.
W. W. Bunnell, Cornish Hollow, Box 7, Farmington, Conn.
B. R. Burmester, Box 270, East Lansing, Mich.
L. E. Burnett, 4735 McRaven Rd., Jackson, Miss.
E. G. Buss, Poultry Dept., Colorado A & M College, Ft. Collins, Colo.
M. W. Buster, Poultry Branch, Prod. & Marketing Adm. USDA, Washington, D.C. 25
C. W. Carbeau, Bilobern Farms, R.D. 2, Elwood City, Pa.
Mrs. R. S. Carpenter, 243 N. Highland St., Arlington 1, Va.
C. I. Carter, Formula Feeds Dept., Alabama Flour Mills, Decatur, Alabama
L. W. Charkey, Colorado A & M College, Fort Collins, Colo.
T. B. Charles, Yellowhouse, Pa.
I. G. Christenson, Chris' Gage County Hatchery, 123 North 3rd Beatrice, Nebr.
J. B. Christansen, Box 1, Washta, Iowa
Andrew Christie, Kingston, New Hampshire
T. B. Clark, Oglebay Hall, Morgantown, West Va.
W. E. Clark, Editor, Poultry Digest, Sea Isle City, N.J.
J. H. Clements, 627 King St., Santa Rosa, Calif.
R. K. Cole, Rice Hall, Cornell University, Ithaca, N.Y.
G. E. Coleman, Jr., Nichols Poultry Farm, Kingston, N.H.
J. B. Collier, Jr., Fort Worth Poul. & Egg Co. Inc., Box 1537, Fort Worth, Texas
G. F. Combs, Poultry Dept., Univ. of Maryland, College Park, Md.
Miss Cora E. Cooke, University Farm, St. Paul, Minn.
G. J. Cottier, Alabama Polytechnic Inst., School of Agriculture, Auburn, Ala.
J. R. Couch, Dept. of Poultry Husbandry, Texas A & M College, College Station, Texas
W. W. Cravens, Feed Research and Nutrition, McMillen Feed Mills, Decatur, Ind.
L. B. Crittenden, 502 Russell St., W. Lafayette, Ind.
Miss Harriette E. Cushman, Extension Service, Bozeman, Montana
S. J. Dalzell, Route 1, Burlington, Wis.
C. L. Davidson, Stone Mt. Grit Co., Lithonia, Ga.
A. L. Dean, Virginia Polytech. Inst., V.P.I. Extension Division, Blacksburg, Virginia
I. Denny, 890 S. Hamilton Blvd., Pomona, Calif.
E. M. Dickinson, Oregon State College, Corvallis, Oregon
F. L. Donsing, Donsing Breeding Farm & Hatchery, Box 208, Rio Linda, Calif.
D. Dorland, RFD 1, Stone Mountain, Ga.
I. Dorn, Box 6258, Tarrant City, Ala.
J. E. Doughty, M & D Sales Co., American Legion Bldg., Snow Hill, Md.
C. I. Draper, Poultry Dept., Utah State Agr. College, Logan, Utah
S. W. Draper, Winder, Ga.
J. C. Driggers, Agr. Expt. Sta., University Station, Gainesville, Fla.
M. R. Dunk, Watt Publishing Co., Sandstone Bldg., Mount Morris, Ill.
R. M. Durr, 209 Peters St. S.W., Atlanta 3, Ga.
R. M. Dyreng, Manti-Apex Hatcheries, Manti, Utah
S. Allen Edgar, Poultry Dept., Alabama Polytech. Inst., Auburn, Alabama
D. P. Ehlers, 227 West North St., Butler, Pa.

W. J. Eicher, 503 Vine St., Archbold, Ohio
L. E. Ellis, R-Way Feed Co., 1 Sebastopol Ave., Santa Rosa, Calif.
A. H. Fingar, RFD 2, Hudson, N.Y.
J. O. Flinn, Tri-County Hatchery Inc., Moorfield, West Va.
J. H. Florea, Poultry Tribune, Mount Morris, Ill.
D. E. Fogg, Merck & Co., Inc., Rahway, N.J.
H. W. Foster, P.O. Box 265, Winthrop, Maine
W. L. Frakes, 508 South 3rd St., Effingham, Ill.
J. C. Fritz, 156 Villa St., Elgin, Ill.
E. M. Funk, 205 Waters Hall, Columbia, Mo.
A. Gannon, Agriculture Ext. Bldg., Athens, Ga.
E. W. Garrison, 19 E. Commerce St., Bridgeton, N.J.
Gassons Poultry Farms, Versailles, Ohio
William Genschmer, Route 1, Box 86, Kenosha, Wis.
L. N. Gilmore, Maritime Milling Co., Inc., 1009 Chamber Commerce Bldg., Buffalo 2, N.Y.
O. E. Goff, Poultry Department, University of Tennessee, Knoxville, Tenn.
R. F. Goodwin, 360—14th St., San Diego 2, Calif.
H. E. Goresline, 1819 West Pershing Rd., Chicago 9, Ill.
G. E. Gouguet, Jr., Box 616, Route 7, New Orleans 23, La.
C. Gregersen, 95 E. Kellogg Blvd., St. Paul 1, Minn.
A. C. Greif, RFD 2, Route 30, Flemington, N.J.
E. D. Griffin, Allied Mills, Inc., Board of Trade Bldg., Chicago, Ill.
J. M. Gwin, Dept. of Poultry Husbandry, Univ. of Maryland, College Park, Md.
E. R. Halbrook, American Embassy, APO 205, Terhan, % U.S. P.M., New York, N.Y.
C. W. Haldeman, 424 N. 19th St., Philadelphia, Pa.
G. O. Hall, Rice Hall, Cornell University, Ithaca, N. Y.
H. G. F. Hamann, 4306 Gallatin St., Hyattsville, Md.
O. A. Hanke, Watt Publishing Co., Mount Morris, Ill.
J. A. Hannah, Box 190, East Lansing, Mich.
R. R. Hannas, 3930 Woodland Ave., Western Springs, Ill.
R. M. Hanson, Box 85, Rt. 1, Corvalis, Oregon. (Life Member)
Harvest Milling Co., 315 S.E. Third Avenue, Portland 14, Ore.
Norman Hecht, Walden, N.Y.
Victor Heiman, Kasco Mills, Inc., Waverly, N.Y.
T. W. Heitz, Poultry Plant Manager, Broadway, Va. (Life Member)
H. C. Helm, The Illinois Hatchery, Metropolis, Ill. (Life Member)
C. H. Henderson, P.O. Box 94, El Cajon, Calif.
L. W. Herrick, Jr., Poultry Dept., Virginia Polytechnic Inst., Blacksburg, Va.
G. F. Heuser, Rice Hall, Cornell University, Ithaca, N.Y.
Burt Heywang, Box 80, Route 1, Glendale, Ariz.
J. S. Higgins, Colonial Heights, Exeter, N.H.
R. D. Hill, Jr., R.D. 5, Lancaster, Pa.
W. R. Hinshaw, 140 Kline Blvd., Frederick, Md.
J. W. Hockersmith, Rhodesdale, Md.
H. A. Hogsett, 1406 S. Park Ave., Pomona, Calif.
R. L. Hogue, Poultry Dept., Purdue University, Lafayette, Ind.
Dent Holcomb, 317 N. Elm, Grand Island, Neb.
J. C. Holmberg, R. 11, Box 856, West Allis 14, Wis.
O. W. Holtzapple, Elida, Ohio
W. K. Hooper, RFD 1, Box 712, El Cajon, Calif.
W. A. Horton, Lawrence, Kan.
L. S. Hubbard, Hubbard Farms, Inc., Lancaster, Pa.
D. R. Huckle, The Park & Pollard Co., 356 Hertel Ave., Buffalo, N.Y.
W. O. Hudgins, 506 Player Drive, High Point, N.C.
C. B. Hudson, Poultry Dept., Rutgers University, New Brunswick, N.J.
F. P. Hurst, Midvalley Hatchery Inc., Dayton, Va.
F. B. Hutt, Rice Hall, Cornell University, Ithaca, N.Y.
R. J. G. Jaap, Poultry Dept., Ohio State Univ., Columbus 10, Ohio

A. W. Jasper, Dept. Agr. Econ., Warren Hall, Ithaca, N.Y.
F. P. Jeffrey, Dept. of Poultry Husb., Univ. of Massachusetts, Amherst, Mass.
J. D. Jewell, P.O. Box 642, Gainesville, Ga.
W. D. Johnson, Route 1, Nottingham, Pa. (Life Member)
C. L. Jones, P.O. Box 648, Birmingham, Ala.
R. E. Jones, S. Hillside Circle, Storrs, Conn.
Dr. Mary Juhn, Dept. of Poultry Husbandry, University of Maryland, College Park, Md.
M. A. Jull, Poultry Dept., Univ. of Md., College Park, Md.
E. Karpoff, 1702—40th S.E., Washington 20, D.C.
H. H. Kauffman, Poultry Extension Dept., State College, Pa.
B. F. Kaupp, 1319 Drexmore Ave., Charlotte, N.C.
H. L. Kempster, University of Missouri, Columbia, Mo.
O. B. Kent, Libertyville, Ill.
A. C. Kimber, Kimber Farms Inc., Pomona, Calif.
J. E. Kimber, Kimber Farms Inc., Niles, Calif.
S. C. King, Rice Hall, Cornell Univ., Ithaca, N. Y.
J. W. Kinghorne, 1365 Iris St. N.W., Washington 12, D.C.
M. Klein, Rt. 79, Madison, Conn.
R. M. Knickerbocker, 441 E. Washington St., Gainesville, Ga.
A. H. Kneedsen, Brookline, N.H.
Wm. Kohlmeyer, Poultry Dept., S. Dakota State College, College Station, S. Dak.
G. B. Koller, 132 East Cypress, Burbank, Calif.
C. H. Koonz, Resarch Laboratories, Swift & Co., Chicago 9, Ill.
F. H. Kratzer, Dept. of Poultry Husb., University of California, Davis, Calif.
E. H. Kurkinen, 3431 S.E. 10th Ave., Portland 2, Ore.
C. E. Lampman, Poultry Dept., University of Idaho, Moscow, Idaho
W. F. Lamoreux, Kimber Farms, Niles, Calif.
G. F. Lang, Ridge Road, R.D. 1, Telford, Pa.
R. Leach, Calif. Polytechnic College, San Luis Obispo, Calif.
T. A. LeBeau, Willowbrook Poultry Farm, R.F.D. 1, Box 30, Springfield, Vt.
C. E. Lee, R.D. 4, E. Genesee Rd., Auburn, N.Y.
H. P. Lee, Lee & Smith Ranch, Midlothian, Texas
Samuel Lepovsky, Poultry Div., Univ. of Calif., Berkeley 4, Calif.
I. M. Lerner, Div. of Poultry Husbandry, University of California, Berkeley 4, Calif.
W. M. Levi, 3-7 Lemmon Building, Sumter, S.C.
F. Libutzke, Dept. of Farm & Markets, State Office Bldg., Hartford, Conn.
R. G. Lindstrom, 6130 Avalon Blvd., Los Angeles, Calif.
T. E. Leucke, Box 200, Route 1, Spring, Texas
H. S. Long, 255 South 12th St., Lebanon, Pa.
Maplecrest Turkey Farms, Wellman, Iowa
D. R. Marble, Rice Hall, Cornell University, Ithaca, N.Y.
H. C. Marbut, Box 56, Augusta, Ga.
R. P. Marsteller, School of Vet. Med., 500 Crescent Drive, Bryan, Texas
G. A. Martin, Dept. of Poultry Science, North Carolina State College, Raleigh, N.C.
J. Holmes Martin, Purdue University, W. Lafayette, Ind.
W. L. Mathews, R 2, Box 47, Burlington, Wis.
E. H. Matzen, 330 High St., Chevy Chase, Md.
E. S. McConnell, Winchester, Ky.
W. M. McGibbon, Poultry Dept., Univ. of Wisconsin, Madison, Wis.
N. R. Mehrhof, Agr. Exp. Sta., University Station, Gainesville, Fla.
H. B. Miller, Box 711, Madison, Wis.
Miss M. L. Mitchell, Lee & Smith Ranch, Midlothian, Texas
R. Mitchell, P.O. Box 730, Gainesville, Ga.
R. J. Mitchell, Box 142, Route 2, Kirkland, Wash.
E. N. Moore, Ohio Agr. Exp. Sta., Wooster, Ohio
J. S. Moore, Agr. Exp. Sta., University Station, Gainesville, Fla.

C. L. Morgan, Poultry Dept., Clemson Agr. Coll., Clemson, S.C.
W. A. Morris, Wilva Farm, Leetonia, Ohio
R. A. Mueller, Poultry Improvement Adv. Bd., 1030 Forum Bldg., 1007 Ninth, Sacramento, Calif.
W. Muller, Poultry Dept., Pennsylvania State College, State College, Pa.
C. D. Murphy, 633 Candler Bldg., Atlanta, Ga.
J. H. Murphy, % Murphy Products Co., Burlington, Wis.
F. Murray, Jr., 812 Donnelly, Columbus, Mo.
F. E. Mussehl, University of Nebraska, Lincoln, Neb.
L. G. Neel, Hales & Hunter Co., 141 W. Jackson Blvd., Chicago 4, Ill.
C. E. Newcomer, Potosi, Mo.
D. S. Newill, RFD 2, Connellsville, Pa.
W. E. Newlon, Poultry Ext., Univ. of Calif., Berkeley 4, Calif.
E. A. Nisson, 418—6th St., Petaluma, Calif.
S. F. Nizenski, Ramona Feed & Supply Co., P.A. Box 641, Ramona, Calif. (Life Member)
L. C. Norris, Rice Hall, Cornell University, Ithaca, N.Y.
L. M. Norris, Box 1104, Kansas City, Mo.
J. F. O'Donnell, Triangle Milling Co., 631—665 N. Tillamook St., Portland, Ore.
Walter L. Offner, Jr., % 252 Southwood, Apt. 3B, St. Louis 5, Mo.
W. H. Ott, 1874 Quimby Lane, Westfield, N.J.
V. A. Parker, Parker's Leghorn Farm, Blachly, Ore.
R. T. Parkhurst, Lindsey-Robinson & Co., Roanoke 3, Va.
E. B. Parmenter, Parmenter Reds, Inc., Franklin, Mass.
A. Passer, Wells Hatchery, Wells, Minn.
L. F. Payne, Dept. of Poultry Husbandry, Kansas State College, Manhattan, Kan.
C. F. Petersen, Poultry Dept., University of Idaho, Moscow, Idaho
H. C. Pierce, Atlantic & Pacific Tea Co., 420 Lexington Ave., New York 17, N.Y.
Kojo Plange, Div. of Poultry Nut., P.O. Box 816, Tuskegee Institute, Tuskegee, Ala.
C. S. Platt, Poultry Dept., Rutgers University, New Brunswick, N.J.
J. J. Platt, 440th Sig. Avn. Cons. Bn., A.P.O. 67, San Francisco, Calif. (Life Member)
Harry J. Prebula, 3 Belmont Circle, Trenton, N.J.
E. C. Quarles, Sunny View Farm, Talbott, Tenn.
J. H. Quisenberry, Poultry Husbandry Dept., Texas A & M College, College Station, Texas
E. D. Rabhan, Winterville, Ga.
S. J. Ranelius, Hastings, Minn.
J. R. Redditt, Cudahy Packing Co., Union Stock Yards, Omaha 7, Neb.
W. B. Rhodes, Rhodes Hatchery, Spencer, West Va.
Wallace H. Rich, W. H. Rich & Son, Hobart, N.Y.
Walter S. Rich, Hobart, N.Y.
H. H. Rieck, RFD 2, Preston, Md.
L. H. Ritzhaupt, Am. Poultry Assn., Box 68, Oklahoma City, Okla.
A. F. Rolf, Standard Feed Milling Co., 8 Fairlie St., N.W., Atlanta, 3, Ga.
A. L. Romanoff, Cornell U., Rice Hall, Ithaca, N.Y.
W. J. Rudy, 125 W. Park, Libertyville, Ill.
J. G. Salsbury, Dr. Salsbury's Lab., Charles City, Iowa
P. E. Sanford, Dept. Poultry Husbandry, Kansas State College, Manhattan, Kan.
L. A. Schafer, Schafer Hatchery, 221 N. First, P.O. Box 75, Springfield, Ill.
Mrs. J. A. Schukoske, R.F.D. 2, Saybrook Rd., Middletown, Conn.
P. H. Seitz, P.O. Box 403, Harrisburg, Pa.
C. S. Shaffner, Poultry Dept. U of Md., College Park, Md.
R. N. Shoffner, Poultry Husbandry Division, University Farm, St. Paul 1, Minn.

H. L. Shrader, Extension Service, USDA, Washington, D.C.
F. D. Simmons, Frank D. Simmons Co., P.O. Box 202, Modesto, Calif. (Life Member)
D. D. Slade, 333 W. 4th, Lexington, Ky.
H. J. Sloan, Univ. of Minn., St. Paul, Minn.
M. C. Small, National Turkey Federation, Mount Morris, Ill.
B. Smith, P.O. Box 1123, Nashville, Tenn.
S. N. Smith, Box 25, Hollis, N.H.
H. J. Souder, The Poultryman, Vineland, N.J.
V. Steckley, Box 148, Kendallville, Ind.
L. W. Steelman, R.F.D 1, Lansdale, Pa.
D. K. Steenburgh, The Feed Bag, 1712 W. St. Paul Ave., Milwaukee 3, Wis.
G. F. Stewart, Dept. of Poultry Husbandry, University of California, Davis, Calif.
F. D. Stone, Land O'Lake Creameries Inc., Minneapolis 13, Minn.
H. O. Stuart, Director, Extension Service, Rhode Island State College, Kingston, R.I.
E. L. Stubbs, Univ. of Penna., 39th & Woodward Ave., Philadelphia 4, Pa.
H. W. Swanson, 13 Stoneleigh Park, Westfield, N.J.
M. T. Swearengen, Henderson Produce Co., Monroe City, Mo.
E. T. Sweet, 71 Spencer St., Lebanon, New Hampshire
J. D. Sykes, 835 South 8th St., St. Louis, Mo.
H. S. Tamimie, 205 Peters Hall, University of Minnesota, St. Paul, Minn.
L. W. Taylor, Div. of Poultry Husbandry, Univ. of Calif., Berkeley 4, Calif.
A. E. Tepper, 87 Mountain Road, E. Concord, N. Hampshire
Wm. D. Termohlen, 6638—32d Plice N.W., Washington 15, D.C.
G. Thieszen, Henderson Hatchery, Henderson, Neb.
R. B. Thompson, Okla. A. & M. College, Stillwater, Okla.
H. W. Titus, Limestone Research Lab., RFD 1, Newton, N.J.
R. O. Townsend, Townsend Ranch & Hatchery, R. 1, Box 104, Chino, Calif.
A. H. Trask, Black River Falls Produce Co., Black River Falls, Wis. (Life Member)
C. J. Tricou, Louisiana Hatcheries, 4001 S. Carrollton, New Orleans, La.
P. F. Twining, Poultry Dept., Univ. of Maryland, College Park, Md.
C. W. Upp, Poultry Res. Dept., La. State Univ., Baton Rouge, La.
S. K. Urner, American Egg & Poul. Review, 92, Warren St., New York 7, N.Y.
Mrs. Robert Van Valzah, Friendly Cottage Farm, Goby, Va.
A. Van Wagenen, 1120 Evergreen Road, Morrisville, Pa.
L. M. Voss, Box 917, Oklahoma City, Okla.
S. M. Walford, 33 Fairview Ave., Wallingford, Conn.
C. W. Wampler, 136 West Elizabeth St., Harrisonburg, Va.
C. C. Warren, Programs Div., Poultry Branch, Prod. & Mkt., Admin, USDA, Washington, D.C.
J. J. Warren, 82 Ward St., N. Brookfield, Mass.
N. F. Waters, Box 270, East Lansing, Mich.
L. A. Watt, Poultry Tribune, Mount Morris, Ill.
J. W. Watt, Poultry Tribune, Mount Morris, Ill.
W. Weiner, 90 So. Main St., Colchester, Conn.
F. D. Wharton, Jr., 4800 S. Richmond St., Chicago 32, Ill.
W. C. Wharton, 706 E. Gage Ave., Memphis, Tenn.
W. R. Whitfield, Extension Service, Iowa State Col. of Agric., Ames, Iowa
H. L. Wilcke, Ralston Purina Co., St. Louis 2, Mo.
H. S. Wilgus, Peter Hand Foundation, 1632 N. Sheffield, Chicago 14, Ill.
Elmer Wilharm, Farmers Produce Co., Tripoli, Iowa. (Life Member)
H. F. Williamson, Box 462, Salisbury, Md.
F. H. Wiltshire, McKeesport, Pa.

AGRICULTURAL COMPANY OF PAN AMERICA

GUILFORD, CONN., U.S.A.

World Shippers of Hatching Eggs, Chicks, Breeding Stock and Poultry Equipment of all kinds.

CHICKS SHIPPED IN ANY QUANTITY FROM A FEW HUNDRED TO PLANE-LOADS

WE HANDLE

U.S. Pullorum Clean chicks, turkey poults, chicken, turkey and duck hatching eggs

Feeds

Vaccines

Poultry and Dairy Equipment

We Ship only the best U.S. products from leading breeders and manufacturers.
We Provide the most efficient service possible
We Give personal attention to each order
We Make it easy for world customers to buy in the United States
We Ship by air or ocean to any country in the world.

YOUR INQUIRIES ARE INVITED.

AGRICULTURAL COMPANY OF PAN AMERICA

GUILFORD, CONN., U.S.A.

A. R. Winter, Poultry Dept., Ohio State Univ., Columbus, Ohio
B. Winton, Regional Poul. Research Lab., Box 270, E. Lansing, Mich.
John L. Weibel, 228 South 9th St., Corvallis, Oregon.
J. L. Wolf, R.D. 5, Bloomsburg, Pa.
A. R. Wood, Luverne, Minn.
H. Yacowitz, Dept. of Poultry Science, The Ohio State University, Columbus 10, Ohio

URUGUAY

J. J. Mallarini, Casilla de Correo 150, Montevideo
H. Trenchi, Yi 1389, Apt. 6, Montevideo

VENEZUELA

Max. Alvarez-laviada, Canonigos a San Ramon, 39-1 Edificio "San Remo," Apto. 20, Caracas

WALES

Miss C. B. Barrett, "Hyfrydle," 48 Wimbourne Road, Pencoed, Bridgend, Glamorgan, Wales
Reginald Beale, Lower House Farm, Nantyderry, Nr. Abergavenny, Monmouthshire
William Evans, Lindens, Trinity Road, Aberystwyth, Cardiganshire
H. G. Hall, National Agr. Adv. Service, Penllwyn, Barn Street, Haverfordwest, Wales
R. F. Hall, 17 Neol Nanteos, Maesybwlch, Aberystwyth, Cardiganshire
R. W. Tomes, Monmouthshire & East Glamorgan Egg Supply, Northcote Lane, Cardiff, Glamorganshire

WALDER
Waldeck
Walchwil
Switzerland

We carry on a large fattening farm.

WALDER EQUIPMENT is the fruit of many years years experience and fully prooved.

Modernst equipment

Incubators and Hatchers
Brooders and all equipments
Electric Heating Thermostats
Egg Grader, Egg Candling
Balance for Hens
Poultry Pickers Skalders
Feathers to dry

Write for full literature.
We look for active representatives.

Please report any errors in the membership list to the Treasurer-Asst. Sec., Dr. Gustave F. Heuser, Rice Hall, Cornell University, Ithaca, N. Y., U.S.A., or to the Secretary-Asst. Treas. Major Ian Macdougall, O.B.E., 45 Bedford Square, London, W.C. 1, England.)

BRANCH ORGANIZATIONS OF THE WORLD'S POULTRY SCIENCE ASSOCIATION

United Kingdom Branch
President: Dr. R. Coles
Secretary-Treasurer: Major Ian Macdougall

Netherlands Branch
Chairman: Dr. L. de Blieck
Secretary: Ir. P. Ubbels

Swiss Branch
President: Dr. Emil Hess
Secretary-Treasurer: Harald Ebbell

South African Branch
Secretary: M. E. Letty

German Branch
Secretary: O. Garlichs

For the stimulation of feed intake of CHICKENS and maintenance of weight gains in the presence of chronic respiratory disease (air sac disease)

AUROFAC®-10
AUROFAC®-2A

FEED SUPPLEMENTS

Both guaranteed in potency and approved for disease-control claims

Workers in poultry nutrition have made various successful tests showing the value of *high-level* AUREOMYCIN feeds in promoting health in chickens.

Specific claims for efficacy can now be made with AUROFAC-10 and AUROFAC-2A. Both of these products are produced at Lederle under inflexible regulations similar to those set up for the production of aureomycin for human use. Both come to feed manufacturers guaranteed in potency and approved for disease-control claims.

Write to Lederle for a folder containing more information on these two products, including recommendations for usage.

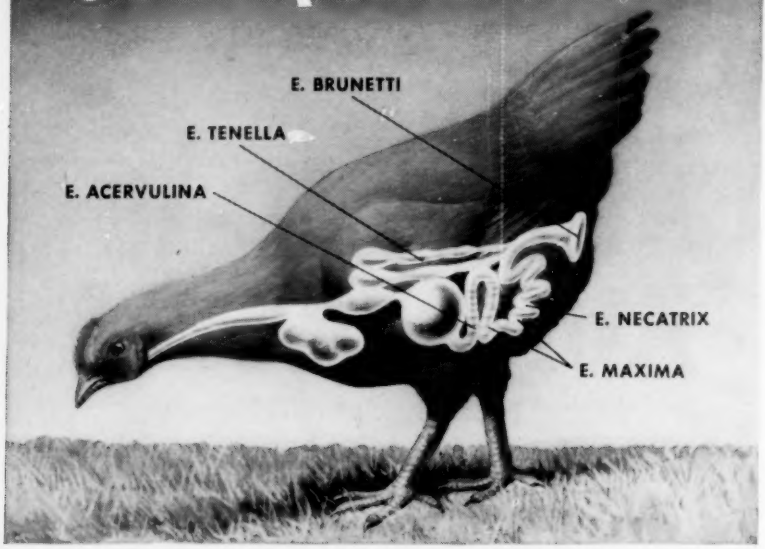
Animal Feed Sales

LEDERLE LABORATORIES DIVISION

30 Rockefeller Plaza AMERICAN Cyanamid COMPANY New York 20, N. Y.

THE SAFEST, MOST EFFECTIVE AGENT for Preventing Coccidiosis Outbreaks!

SULFAQUINOXALINE



There are many species of coccidia that attack the gut in different places. SULFAQUINOXALINE is the *only* agent that combats *all* dangerous types of poultry coccidia.

To make profits, poultrymen must keep costs down and quality up. Prevention of coccidiosis outbreaks with a *reliable* coccidiostat may spell the difference between profit and loss.

Experience with hundreds of millions of birds has proved SULFAQUINOXALINE the *safest* and *most effective* over-all coccidiostat available. Fed continuously at preventive levels, SQ has reduced mortality to *less than 2 per cent* and also has drastically reduced stunting due to coccidiosis. These benefits sharply lower production costs and improve quality. Exposed birds protected with SULFAQUINOXALINE also use feed more efficiently, and weigh more at market time.

SULFAQUINOXALINE has been proved scientifically and commercially. It is the coccidiostat backed by the most extensive research. You can recommend SQ confidently to every poultryman.

MERCK & CO., INC.
Manufacturing Chemists
RAHWAY, NEW JERSEY

PRODUCTS *of* SCIENTIFIC MERIT...

a guiding principle for 24 years

Twenty-four years ago Whitmoyer Laboratories was founded on the policy of formulating "Products of Scientific Merit." That is still our guiding principle today.

Through a constantly expanding program of sound, scientific research, we have striven to assist the poultry and feed industry in solving many disease and nutritional problems. Among several significant developments, in which we were commercial pioneers, are the following:

- Marketing cod liver oil with the vitamin A and D unit potency standardized and guaranteed—WHIT-COD.
- Producing a stabilized "protein-bound" iodine—in combination with other important trace minerals—TRA-MIN.
- Using sulfa compounds for treating certain poultry diseases —SULFATROL.
- Manufacturing a safe, dependable poultry delouser containing Benzene Hexachloride—Whitmoyer BHC ROOST PAINT.
- Formulating worm treatments which effectively remove the common species of tapeworms, as well as large round worms and cecal worms—VERMEX POWDER and VERMEX TABLETS.
- Recognizing the value of antibiotics in treating certain specific disease conditions in poultry.

You can depend on our highly-trained research staff to make certain Whitmoyer Products are scientifically sound . . . economically practicable.

We welcome your inquiries for data on Whitmoyer Products . . . or for consultation with our staff members on disease or nutritional matters.

Whitmoyer LABORATORIES INC.

Manufacturing Chemists

MYERSTOWN, PENNA., U.S.A.

Branch Plant
Rockland, Maine

In Canada
Whitmoyer Laboratories, Ltd.
Yarmouth, N.S.

Give them "teeth"

to grind their feed...

help prevent "paste-ups" and intestinal disorders

FOLLOW THESE 3 STEPS TO GROW BIG, STURDY BIRDS!

FINE SIZE STONEMO

First 2 days—Feed fine chick grains and fine-size STONEMO. Mix 10 lbs. grain to 1 lb. grit.

3 days to 4 weeks—Start feeding mash...give fine-size STONEMO in HOPPER-PAK, or hoppers.

MEDIUM SIZE STONEMO

4 weeks to 8-10 weeks—Gradually switch to medium-size STONEMO—then keep hoppers full.

COARSE SIZE STONEMO

8-10 weeks on—Switch to coarse-size STONEMO. Then keep it before birds at all times...during growing period and in laying house.

Your chicks need "teeth" to help grind their feed—*right from the start*. So start your chicks right! Give them STONEMO Granite Grit, from the very first!

For the first 2 days, many poultry authorities recommend feeding only fine chick grains and fine-size STONEMO—10 lbs. of grain to 1 lb. of grit.

This helps prevent "pasting up"...sticky droppings...other intestinal disorders... and helps you get your chicks off to a good start.

PROVIDE STONEMO FREE CHOICE—

On the third day, start feeding mash—and sprinkle a little fine-size STONEMO on top of it for 2 or 3 days. Then set out HOPPER-PAKS, or provide STONEMO in clean hoppers. Let the birds have all they want.

Follow the program at left. It's endorsed by leading breeders, hatcherymen, and feed manufacturers. It will help you save feed—save money—and grow big, sturdy birds this year!

STONE MOUNTAIN GRIT COMPANY, INC.

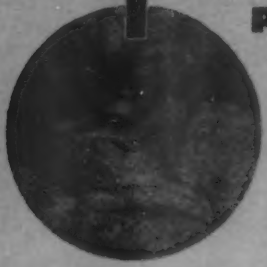
Executive Offices and Quarry: LITHONIA, GA.
Branch Quarry: BARRE, VERMONT

STONEMO

The Grit with the EXTRA GRINDING SURFACES

new!
DR. SALSBURY'S
Infectious Bronchitis Vaccine

from DR. SALSBURY'S
NEW, BIOLOGICS Production Laboratory



EASY TO USE
With Plastic Nose Dropper

COLORED DILUENT
Shows Which Birds Are Vaccinated

VACULIZED
To Retain Full Strength

SAFE FOR BIRDS OF ALL AGES
When Not In Production

After years of intensive research, Dr. Salsbury's Laboratories has developed this new, attenuated vaccine, which has been proven safe and effective for the prevention of Infectious Bronchitis in chickens.

Fundamental research on this new Infectious Bronchitis Vaccine was conducted by Erwin L. Junglerr and Roy E. Luginbuhl, Department of Animal Health, University of Connecticut.

tested on 20 MILLION birds

Qualified state and college authorities have successfully tested Dr. Salsbury's Infectious Bronchitis Vaccine for safety and effectiveness in 20 states on over 20 million birds.

Distributed in conformity with regulations of various states. Write for literature and complete information.

DR. SALSBURY'S LABORATORIES,
Charles City, Iowa

a complete line of poultry medicines, disinfectants, bacterins and vaccines

Dr. SALSBURY'S

TENTH
WORLD'S POULTRY
CONGRESS

EDINBURGH
SCOTLAND

AUGUST 13 - 21

1954